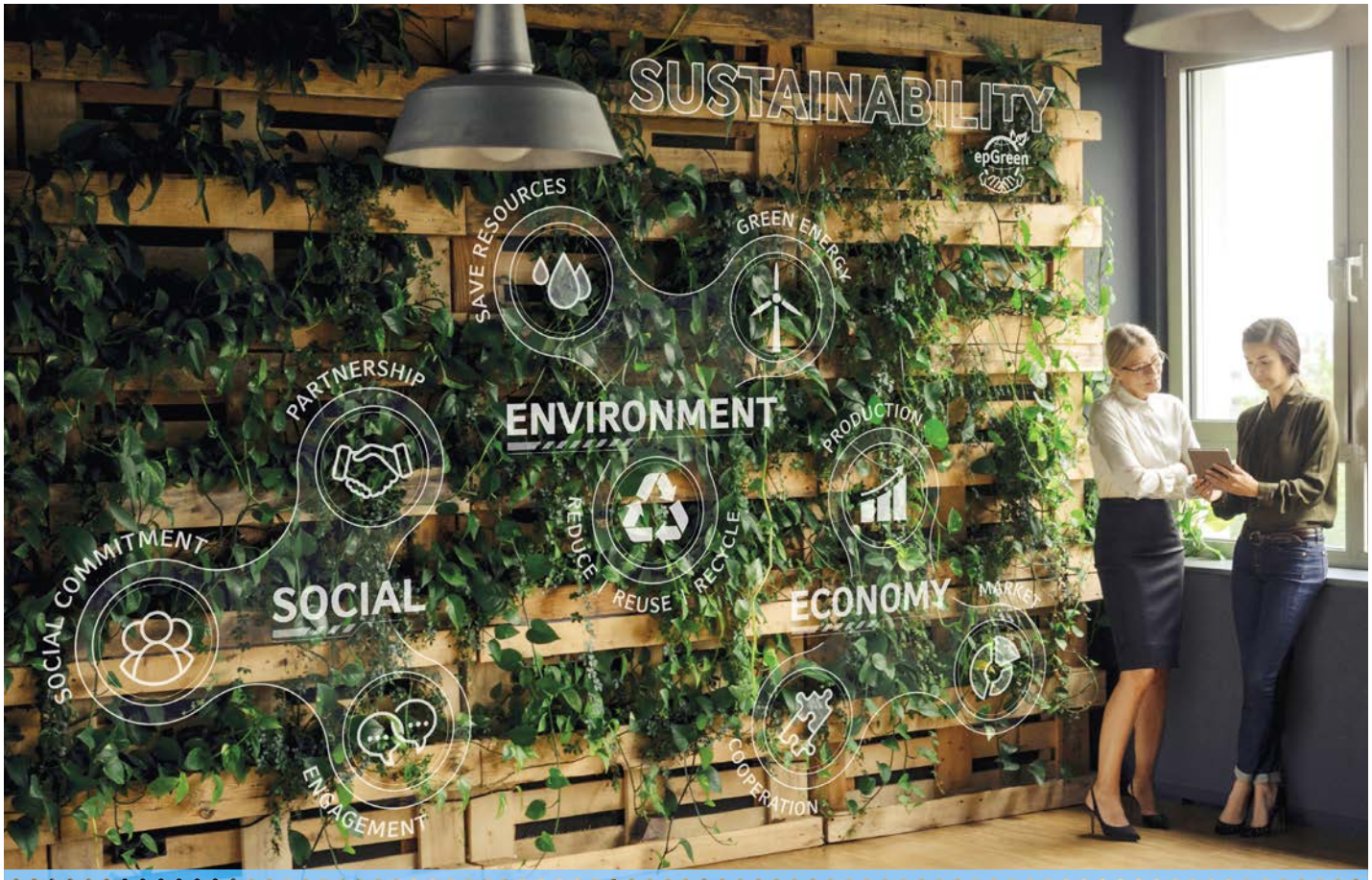
eppendorf



Let's Care Together

Sustainability at Eppendorf

The Future is Green

Dear Readers,

Back in 1970, the founders of Eppendorf, Dr. Heinrich Netheler and Dr. Hans Hinz, established a clear purpose for our company: to improve human living conditions. Now, some 50 years later, Eppendorf has done much to fulfill this mission and far more is to come: We published the first Eppendorf Group Sustainability Report in 2022, we signed the UN Global Compact, we developed a path to cut down our CO_2 emissions in our own operations down to zero by 2028.

Eppendorf continues to grow as an international company while the demand for Eppendorf's life science products and services has never been higher. The recent pandemic has clearly demonstrated premium laboratory products and services make a crucial contribution to society.

At the same time, we are aware that our business activities have an impact on the environment and, in some cases, they can exacerbate climate change. As a company, we intend to fulfill our pledge to protect the climate and have committed ourselves to cutting our carbon emissions by implementing science-based targets. This work involves analyzing, documenting, and publishing our greenhouse gas emissions.

Sustainability is an issue that poses many challenges but it also offers many opportunities. In our efforts, we are focusing on areas where we can make the most effective contribution to sustainably developing of both the economy and society as a whole.

Join us on this journey towards more sustainable conditions in life-science laboratories

Sincerely,
Your Eppendorf Sustainability Team

Proactively Sustainable

To achieve sustainable success, we consider not only financial but also environmental and social aspects in our business activities and strive to harmonize these three dimensions. Sustainability is an integral part of our company:

> Our products are becoming ever more sustainable and help ensure that research can be carried out optimally all over the world.
> We work continuously to protect the environment and are aware of our significant responsibility as an employer in our actions toward our employees.
> We closely link all facets of our commitment to society to our core competencies.
> We consider our compliance with laws and regulations as more than just a matter of course.

A systematic approach to sustainability
Our purpose "to improve human living conditions" requires that we positively transform the Eppendorf Group so we operate safely within the planetary boundaries and respect humanity: We intend to cut our carbon emissions down to zero by 2028, minimize the use of natural resources, and improve human well-being throughout our value chain.

This vision is part of our strategic approach to take responsibility and contribute to sustainable development. The heart of this strategic framework is a combination of integrating various perspectives on 20 responsibility topics relevant to Eppendorf and involves engaging in dialogue with various stakeholders, drawing on data and using an impact analysis to determine our environmental and social footprint, and carrying out a success-oriented assessment.

Improve human living conditions
Our purpose to improve human living conditions has always been at the center of our activities. Founded in Autumn 1945 by Dr. Heinrich Netheler and Dr. Hans Hinz as a "start-up" for medical instruments at the University Hospital of Hamburg-Eppendorf, the company was originally named "medeor" which means "I heal" in Latin. Today, the company is still owned by the families of these two founders.

Sustainability Report

The Eppendorf Sustainability Report 2022 provides information on all the company's activities and goals related to this topic. This is Eppendorf's second sustainability report and is available online as a PDF document.
The publication provides:

> Reporting in accordance with the globally used framework Sustainability Reporting Standards of the Global Reporting Initiative (GRI).
> Information from 2022 about susainability at the Eppendorf Group.
> Focus on the four guiding themes of climate change, natural resources, social compliance, and social well-being from our sustainability strategy.

These topics are essential for us:

> Climate Change
> Natural Resources
> Social Compliance
> Social Well-Being

Stakeholder-, impact-, and success-oriented
For years now, Eppendorf Group has taken its corporate responsibility very seriously. To intensify the systematic integration of environmental and social aspects of corporate responsibility into the Group's activities, Eppendorf has established a clear strategic framework for moving forward.

Sustainability throughout the entire value chain
Corporate responsibility does not just begin and end with producing and selling a product. Instead, the focus is on each step of the entire value chain. For this reason, our strategic framework includes many topics in the areas of climate change, natural resources, social compliance, human well-being, digitalization, and society – from the raw materials supplier to the customer.

Our management team is committed to ensuring the successful implementation of our sustainability strategy, and each member of the Board of Management has assumed responsibility for a specific guiding theme. Co-CEO Eva van Pelt has overall responsibility for strategy and governance.

Read our Sustainability Report::
www.eppendorf.com/sustainability-report

Neutral as a Company by 2028

The 2015 Paris Climate Agreement, a treaty on climate change agreed by over 190 countries, limits the global temperature increase to well below 2 °C and calls for continuing efforts to limit this to 1.5 °C. Industry is one of the largest emission-producing sectors, making it essential for industry to contribute to achieving the Paris accord's reduction targets. **Eppendorf has set its goal: We intend to cut our carbon emissions in our own operations down to zero by 2028.**

Eppendorf faces up to its responsibility and has clearly anchored the core issue of sustainability within the company's corporate strategy. To achieve our carbon emission reduction goal, the Eppendorf Sustainability & HSE team has developed a climate strategy that specifies concrete measures that we can implement to significantly reduce our CO_2 emissions of Eppendorf as company (Scope 1 + 2 and, in part 3). What are our steps to reach this ambitious target?

> **Switching to renewable energy sources** at all company sites worldwide. We already use 100% green electricity at most* of our production facilities and in the global headquarters (CO_2 emissions in 2022: -58% compared with 2019 Scope 1 + 2).
> **Establishing high climate standards for new buildings** to achieve German Sustainable Building Council (DGNB – Deutsche Gesellschaft für Nachhaltiges Bauen) platinum certification, the highest award for sustainable construction in Germany.
> **Optimizing building energy efficiency** to consume fewer resources.
> By further **reducing air freight,** increasing rail and sea freight.
> Electrifying the corporate vehicle fleet to **lower the fleet's CO_2 emissions.**
> Widely promoting **environmentally friendly travel** throughout the company.
> We want to benefit more than before from **"swarm knowledge" by systematically developing and transferring knowledge**.
> **Launching a competition for climate projects** to acknowledge particularly exceptional climate projects.

* Except one facility in Japan and one facility in China.

Emission savings by switching to renewable energy sources at Eppendorf worldwide:

EcoVadis

Scoring systems like the ones provided by EcoVadis act as an important industry reference for assessing corporate sustainability. EcoVadis assessments evaluate companies for their practices in several major areas:
> Take responsibility as a company for the environmental impacts of your company operations.
> Ethics cover corruption and bribery, anticompetitive practices as well as responsible marketing.
> Sustainable procurement describes the source of resources and parts.
> Ensure human resources address health, safety, and working conditions as well as offers structured social dialogue, career management opportunities, and training.
> Review human rights issues to avoid child labor, forced labor, and discrimination.

Eppendorf is listed at EcoVadis. Learn more at:
www.ecovadis.com

UN Global Compact

By participating in the UN Global Compact, Eppendorf commits to the pact's 10 principles on human rights, labor, environment, and anticorruption. Before a company may join the UN Global Compact, its management must commit to the ten principles in a Letter of Commitment.
> Co-CEOs Eva van Pelt and Peter Fruhstorfer signed the company's Letter of Commitment in January 2022.
> Every year, Eppendorf will document and publish the progress it makes on all its activities.

Learn more at: **www.unglobalcompact.org/what-is-gc/participants/150024-Eppendorf-SE**

Code of Conduct

Eppendorf considers compliance with legal requirements to be more than just a matter of course: We set company standards that exceed those required by law. When joining the company, every employee of Eppendorf SE and its majority-owned subsidiaries in Germany and other countries agrees to comply with the Eppendorf Code of Conduct. This code includes guidelines on how to behave in accordance with the company's ethical standards. Eppendorf also ensures certain standards are maintained in its supplier relationships and imposes the Eppendorf Code of Conduct for Suppliers.

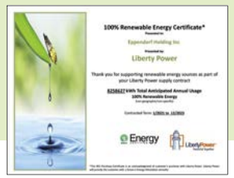
Read our Code of Conduct:
www.eppendorf.com/terms-and-conditions

Please find more details at:
www.eppendorf.com/sustainability

From Power to Printing: Eppendorf is Changing

Green electric energy
Most* Eppendorf production facilities exclusively fulfill their energy requirements with renewable energy sources that meet legal environmental standards. Consequently, these Eppendorf production facilities achieve net zero emissions in their calculated electricity consumption. This means that Eppendorf locations in Europe and the United States offset their emissions by using wind, solar, and hydropower.

* Except one facility in Japan and one facility in China.



assembled with green power

In 2021, our German facilities used 38,600 MWh of certified green power, resulting in a non-emission of about 16,000 t of CO_2 emissions compared to power from classic sources.
> Eppendorf reduced the company's global CO_2 emissions by around 58% in 2022 compared to 2019.
> Our headquarters building and local production facilities for instruments and liquid handling have been using 100% green power since 2020.
> Our production facility in the USA is powered by 100% wind energy.
> The assembly of our ULT freezers in the UK has fully relied on 100% renewable energy since 2018.

We recently acquired a factory in Japan that produces our high-speed and ultracentrifuges. Due to local conditions and contract obligations, the facility still consumes power from classic sources. All the products assembled in our Eppendorf locations in Europe and the United States do, however, fully rely on 100% renewable electric energy contracts to meet their power needs.

Sustainable architecture
Buildings not only fulfill a purely functional purpose. They also depend on the environment that surrounds them and serve the people who use them. People spend most of their time in buildings. It has been proven that buildings greatly influence the subjective well-being, health, and productivity of individuals. As a result, people must be placed at the center of building design. This means sustainable building design goes beyond addressing cost effectiveness and the conservation of resources and energy to also incorporate a high level of user comfort as well as ecological, economic, and socio-cultural aspects.

Eppendorf is pursuing ambitious goals in Juelich/Germany, where our bioprocess center is expanded. The new building will meet the highest quality requirements in accordance with the **Platinum Standard of the German Sustainable Building Council.** This is for example based on usage of recycled building materials and the installation of a photovoltaic system that will fully cover the building's energy needs.

Still printing? Yes …
Despite the trend toward digitalization, Eppendorf still has a need to produce paper-based marketing materials such as flyers or brochures. To limit the impact, we:
> Print materials only in small quantities exclusively for defined purposes such as trade fairs, presentations, or customer visits and only after consulting with our sales regions.
> Print materials at a local printing facility near company headquarters.
> Switched from normal (certified) paper to 100% recycling paper for print runs of new marketing material beginning of 2022. We are taking a step-by-step approach by reprinting marketing materials with recycled paper when copies of a given publication are no longer available.
> Expect a further downscale of paper-based materials thanks to an increased focus on digital formats.
> Produce the Eppendorf product catalog based on classic (certified) paper due to the need for thin paper used in combination with stability. Since 2014, the catalog print run is compensated by "Print&Forest".

Please find more details at:
www.eppendorf.com/sustainability-commitments

Corporate Citizenship

We are a family-owned company that has always been – and will continue to be – committed to upholding our responsibility to society. We place a high value on corporate citizenship and demonstrate this in our actions.

We welcome the heterogeneity and individuality of our stakeholders as well as the diversity of their cultures, world views and personal biographies.

Every day, we discover new potential and opportunities for improving our efficiency on the market – and heightening our mutual respect and esteem. Our social commitment extends to launching green initiatives and supporting society through a variety of awards and programs.

The Eppendorf Award for Young European Investigators acknowledges outstanding contributions to biomedical research in Europe based on methods of molecular biology, including novel analytical concepts. Since 1995 the Award is granted annually and is presented in partnership with the scientific journal Nature.

Discover more about the Eppendorf Award: **www.eppendorf.com/award**

The international Eppendorf & Science Prize for Neurobiology is awarded each year to one young scientist for the most outstanding neurobiological research based on methods of molecular and cell biology. Eppendorf teamed with Science, the academic journal of the American Association for the Advancement of Science, to establish this prize in 2002.

Learn more about the Eppendorf & Science Prize: **www.eppendorf.com/prize**

The UN goals “Good Health and Well-being, Gender Equality, and Clean Water and Sanitation” are part of the global sustainability goals formulated in 2015. We have been supporting these important activities behind these goals since 2021 through our Eppendorf Improving Life Program.

Read about our project with Plan International**:** **www.eppendorf.com/sustainability-citizenship**

Save Energy

How to improve cold storage in the laboratories?
Global warming is a challenge to all of us. Sustainability discussions primarily focus on energy consumption. Laboratory devices are no exception: Even the most environmentally friendly and energy-efficient ultra-low-temperature freezers still require a significant amount of energy to maintain the extremely low temperature of -80 °C, 24 hours a day, seven days a week, for years and years.

The non-profits My Green Lab® and the International Institute for Sustainable Laboratories (I2SL) partner to reward the best sustainability concept for improving cold storage regarding sustainability:

The Freezer Challenge
Participants in the competition earn points by, for example, taking action on the basis of good laboratory management practices, including temperature tuning, and other areas, as well as for sharing information about best practices. Award recipients are laboratories that have done the most to save energy and improve their sample storage practices. Since 2017, the challenge has contributed to improvements in cold storage that have saved millions kWh of power worldwide, just in 2022 alone, these savings totaled 9.5 mio kWh. Based on our responsibility for the environment, Eppendorf is proudly sponsoring the 2023 International Freezer Challenge for the sixth time in a row, starting in 2018.

Check out the International Freezer Challenge: **www.freezerchallenge.org**

Key figures from the 2022 Freezer Challenge
> 1,200+ labs involved
> 27 countries represented
> 9.5 million kWh/year savings

Protecting the Product

Efficient packaging design
The most sustainable packaging would be no packaging at all. In real life, however, packaging is always needed to protect a product. The packaging protects the product from different aspects like transportation damage or climatic influences such as humidity in the form of rain, fog, or snow. Without the product packaging protection, the delivered product may have to be replaced, which, in the end, achieves the exact opposite of saving resources.

Product protection has high priority at Eppendorf: Prevention of transport damage is one of the most environmentally friendly solutions.

The correct use of materials does, however, also play a crucial role in sustainability at Eppendorf. In shifting to more sustainable packaging material, we consider a range of goals, including to reduce the use of natural resources, lower CO_2 emissions, save weight, and generate less plastic waste.

Cardboard
When it comes to product packaging made of cardboard, we take care to ensure that an increasing proportion of recycled material is used. The current proportion of recycling material for cardboard housings depends on the stability requirements:

> For heavier instruments, a remaining amount of 30 - 40% fresh fibers may be needed for optimal stability.
> Lighter products like pipettes can be packaged within boxes made of nearly 100% recycled fibers.
> Plastic-free product packaging can lead to a far higher usage of paper resources and a higher CO_2 level due to higher shipment weights compared to a smart plastic-foil-cardboard hybrid. Every packaging design has to be checked individually to determine the best material in terms of sustainability and safe transport.

At Eppendorf, we individually evaluate each new product and packaging design to determine the best material in terms of sustainability and safe transport to the bench in customers' laboratories.

On the Road to Your Laboratory

In general, Eppendorf products are shipped by container ships from our central first hub to our regional distribution sub hubs. By maintaining several global distribution sub hubs, we reduce global drop shipments to a minimum.

In 2019, 16% of our products (in terms of weight) were transported by plane. Due to the urgent global request for laboratory equipment during the pandemic, we saw a significant increase in emission levels for airfreight in 2020. We are aiming to significantly reduce the amount of airfreight to below 2019 levels.

Logistics
Our supply teams optimize the content of each container to effectively maximize space. On average, a 20 feet standard container can – for example – be filled with up to 11 ULT freezers.
> Based on literature the ship-based transportation of a freezer from Europe to the United States may have an impact of about 35 to 40 kg of CO_2 (15 to 17 g/t and km, depending on the source of information; freezer gross weight about 400 kg; distance from Rotterdam/NL to New York/USA is about 5,900 km).
> Based on different sources, a cargo flight between Amsterdam/NL and New York/USA generates about 1,000 to 1,200 kg of CO_2 for a package of 400 kg (flight distance is about 6,000 km; source: www.cargolux.com).
> Local transportation is based on trucks. Many logistics companies have started to use electric vehicles for transporting lightweight goods; use of heavy electric trucks is, however, still in a very early stage. The weight and size of many Eppendorf products require that trucks be equipped with a lifting ramp.

Create Trust: Independent Validation

At Eppendorf, we respect external test procedures and external independent test results of our products. Besides external test house checks for the ULT freezers, we ask for independent validation by third party organizations like ENERGY STAR®, My Green Lab®, or ISCC PLUS (International Sustainability & Carbon Certification). Independent validation contributes to building trust in our products and services.

ACT®-labeled Products:

Separation & Instruments

CryoCube® F570h and F570n

CryoCube®, F740hi and F740hiw

CryoCube® FC660h

CryoCube® F440h

Centrifuge 5910 Ri

Centrifuge 5427 R

Liquid Handling

Eppendorf Research® plus, single-channel

Electronic Pipette: Eppendorf Xplorer® and Xplorer® plus

Consumables

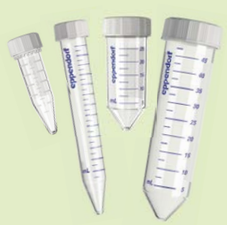
Eppendorf Tubes® 5 mL

Eppendorf Conical Tubes 25 mL

Eppendorf epT.I.P.S.® Motion as Reload System

Eppendorf epT.I.P.S.® BioBased Reloads

Eppendorf epT.I.P.S.® 384 Reloads



Eppendorf Tubes® BioBased

Combitips® advanced

Eppendorf collaborates with My Green Lab, an international NGO that has been validating and assessing laboratory products with the "ACT" – The Environmental Impact Factor Label since 2017. We are proud of a growing number of ACT validated and certified Eppendorf products, including various tips, tubes, ULT freezers, and pipettes. More products are set to receive this label in the future.

ENERGY STAR, well known from consumer goods validations, is a program run by the United States Environmental Protection Agency (US EPA). Since 2017, Eppendorf has partnered with ENERGY STAR to carry out independent testing and validation of our ULT freezers.

ISCC PLUS (International Sustainability & Carbon Certification) is a global certification system that helps companies meet their sustainability requirements for all feedstocks and markets. By supporting traceability throughout the supply chain, the certification system enables each player to source sustainable products from any certificate holder.

The Eppendorf quality management system fulfills the requirements of the international standard of DIN EN ISO 9001. The company's environmental management system fulfills the requirements of the international standard, proved by the DIN EN ISO 14001 certification. We aim to not only continuously optimize our environmental management system, but to also improve our environmental performance over the long run.

Find more information about ACT-labeled Eppendorf products:
www.eppendorf.com/sustainability-products

Relevant Aspects of ACT Labeling

The ACT label provides an easy and intuitive way to evaluate the sustainability of a selected product. In assessing sustainability, the label combines accountability (A), consistency (C), and transparency (T) in respect to manufacturing, energy consumption, water usage, packaging, and end-of-life disposal of a product. Each product awarded an ACT label is validated and scored on the basis of a number of different ACT "Environmental Impact Factors" (EIFs). Each EIF is rated on a scale of 1 to 10, with 1 indicating the lowest environmental impact and 10 the highest environmental impact.

The scoring of the data is performed by the independent organization Sustainability Made Simple Collaborative (SMSC) and then verified and published by My Green Lab. The total score is finally summed up. In principle, the ACT label is a scoring card about sustainability.
Resembling a nutrition label, the ACT label is simple to read and understand: The lower the product's score, the lower the product's impact on the environment. The label can be read like a nutrition label.

ACT Environmental Impact Factors in Detail:

Manufacturing Impact Reduction:
Proof that the facility has considered activities to reduce the environmental impact (energy, water, waste) in recent years.

Responsible Chemical Management:
Proper handling of chemical reagents during production, including storage, safety guidance, and documentation.

Renewable Energy Use:
Is production/assembly based on renewable energy?

Product Content:
List of the major parts and materials of the product, including recycling share and locally sourced parts and materials used in the product.

Packaging Content:
List of the major parts and materials of the packaging, including recycling share and locally sourced parts and materials used in the product.

ACT.
The Environmental Impact Factor Label

Shipment Impact:
Type of transportation and distance from production facility to the product's market.

Energy Consumption:
Amount of energy needed to use the product.

Water Consumption:
Amount of water needed to use the product.

Lifetime Rating:
Longevity of equipment as a key to save resources.

Product End-of-Life:
Consideration of the need for instruments comprised of many different materials to be recycled sustainably by certified local recycling companies.

Packaging End-of-Life:
Consideration of the recommendation to collect and recycle all parts of the packaging (cardboard, plastic foils, cushion material) after the product has shipped and arrives at its destination.

Find a list of all ACT-labeled products:
https://actdatabase.mygreenlab.org/

White Paper 61: "Beyond Energy – ACT Sustainability Label for ULT Freezers":
www.eppendorf.com/wp61

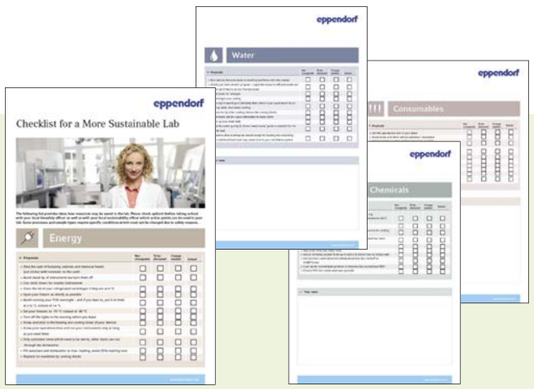
Becoming More Sustainable in Your Lab

We avoid plastic when we go shopping, we bike to work, we switch off the lights to save energy, and we feel responsible for the impact we have on the environment. And then we arrive at our laboratory …

If you want to take action to boost sustainability in your laboratory, you are probably wondering where the best starting can be. At this point, it makes sense to closely examine your own routines and methods. Doing this will help you identify various laboratory processes that hold a potential to optimize. And despite their simplicity, small steps can have a big impact: What are some best practical tips to help you get started?

> Energy savings: Exploit the large saving opportunities
> Organizing your samples: Store more samples per freezer
> Digitalization: Improve paper-free documentation
> Waste reduction: Smart experimental designs can reduce the waste load
> Water consumption: Cooling can be reached by alternative methods

But please keep in mind that also social aspects are part of the sustainability approach.



Where to start improving sustainability? These checklists may help: **www.eppendorf.com/checklist-sustainable-lab**

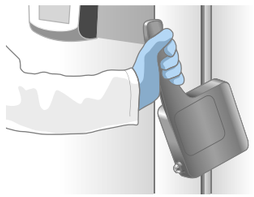
my green lab ambassador

If you would like training on this topic, we recommend the My Green Lab Ambassador Program. The online learning program is free and provides a quick introduction to laboratory sustainability as well as ideas on sustainable actions you can implement at your organization: **www.mygreenlab.org/ambassador-program.html**

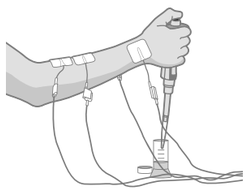
Ergonomics – It's About You!

In today's laboratories, workflows are condensing more and more, and this had led to an ongoing rise in the strain caused by laboratory work. This makes the ergonomics of laboratory devices and the overall work environment increasingly important. Implementing ergonomic solutions in the laboratory lessens the impact of laboratory work on personal health and lowers status or corporate sickness levels of employees due to back bone trouble or hand-wrist load – everyone tries to reduce the stress.

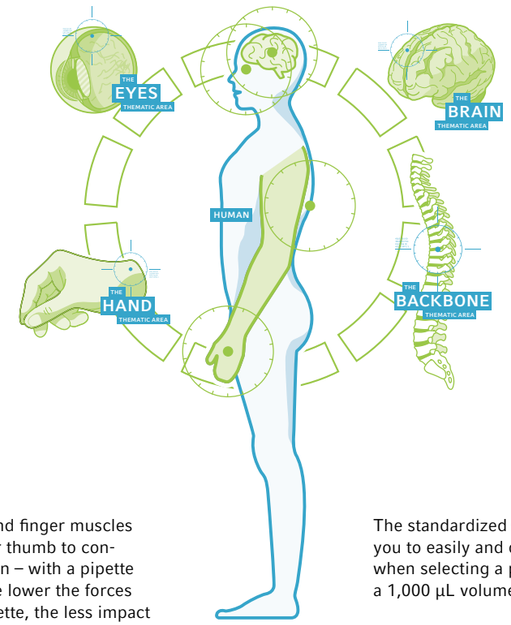
Ergonomics goes far beyond the "ergonomically designed chair". At the beginning of the 1970s, we began optimizing the ergonomics of our laboratory equipment. In 2003, we launched the PhysioCare Concept®, which was focused on liquid handling devices such as our pipettes. Today, the PhysioCare Concept implemented in all Eppendorf products supports the well-being of our users.



An ergonomically shaped door handle provides easy access to your ULT freezer.



In addition placing stress on your arm and finger muscles when you hold it, a pipette requires your thumb to constantly work – up and down, up and down – with a pipette in your hand, it´s constantly at work. The lower the forces to operate the control buttons of the pipette, the less impact to your thumb.



An ergonomically shaped and free-moving lid handle lets you conveniently open and close the cycler lid.

The standardized specific color code on the pipettes allows you to easily and quickly identify the volume class you need when selecting a pipette. Like blue indicates a pipette with a 1,000 µL volume class and a yellow one with 100 µL.

White Paper 71 "How Can I Improve Sustainability in My Lab?":
www.eppendorf.com/white-paper-71

PhysioCare concept

Learn more about ergonomics in the lab:
www.eppendorf.com/physiocare

Get It Cold

The coolant or cooling liquid in a ULT freezer, a refrigerated shaker, or a refrigerated centrifuge lowers and regulates the temperature in the device. There were different kinds of coolants being used. Based on the Montreal Protocol (1987/89), ozone-depleting Chlorofluorocarbons (CFC) were phased-out. To reduce global warming, there is now a clear tendency towards switching from their successors, the classic cooling liquids of Hydrofluorocarbons (HFC) as R508B, R404A, or R134a to a third group: Hydrocarbons (HC), known as green or natural coolants, such as R170 or R290.

These future-proof green coolants have a very low Global Warming Potential (GWP) of nearly zero. Please compare the GWP of different cooling liquids in Figure 1.

> The Regulation No. 517/2014 (F-gas Regulation) of the European Union supports this change: According to this regulation, the amount of new HFC in the EU is to be limited to 21% of the 2015 amount by 2030.
> Eppendorf launched its first ULT freezer with green cooling in 2008 – far earlier than most of our competitors. We now have 15 years of experience with these coolants in R&D, production, logistics, and service in the field.
> We launched our first green cooling centrifuge beginning of 2023.
> Table 1 shows the huge difference in the GWP when comparing a typical 570 L/400-box ULT freezer using classic HFC coolants and those using green HC coolants.

ULT freezer	Cooling liquid	Filling	GWP	GWP in CO_2 equivalent	Total GWP in CO_2 equivalent
Former generation	HFC (R404A)	190 g	3,920	745 kg	4,256 kg
	HFC (R508B)	262 g	13,400	3.5 kg	
Current generation	HC (R290)	100 g	3	0.3 kg	ca. 0.9 kg
	HC (R170)	100 g	6	0.6 kg	

Table 1: Comparison of a 570 L/400-box freezer with classic HFC coolants and those with green HC coolants in terms of GWP (Global Warming Potential).

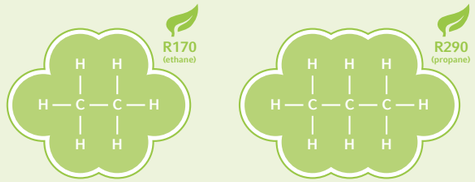


Figure 2: Hydrocarbon-based cooling liquids (“green refrigerants”) R170 and R290.

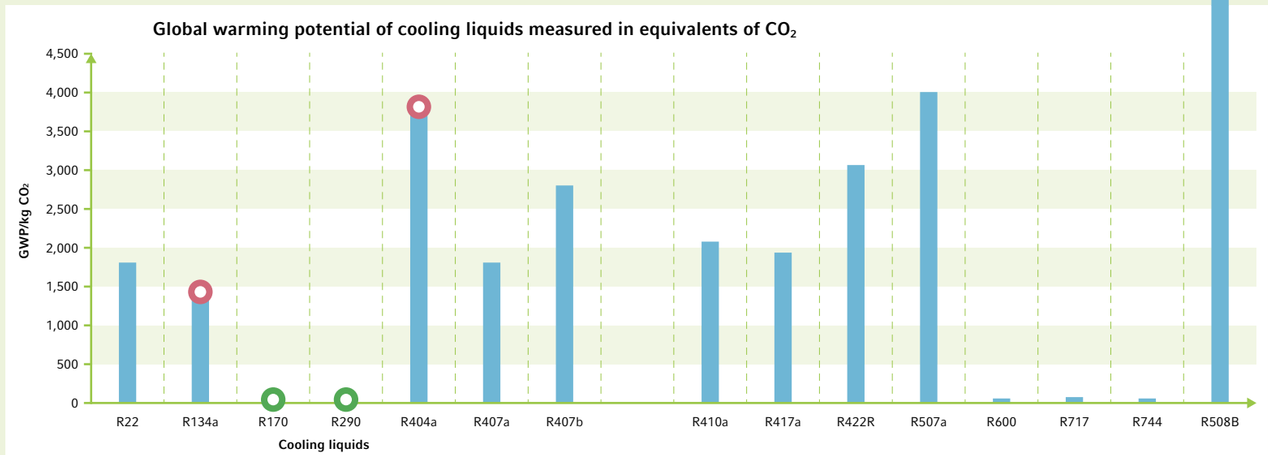


Figure 1: Comparison of a 570 L/400-box freezer with classic HFC coolants and those with green HC coolants in terms of GWP (Global Warming Potential).

The Centrifuge 5427 R is now equipped with propane instead of the previously used refrigerant R134a. This reduces the coolants’ GWP from 200 kg CO_2 equivalent to about 0.5 kg.

Read more about the F-gas regulation and the future of cooling liquids in ULT freezers:
www.eppendorf.com/flyer-cooling-liquids

Who Requires the Most Energy?

Have you ever considered the energy consumption rates of all your laboratory instruments? Guess which device might have the highest consumption rate? Your ULT freezers? Really? … That all depends on the perspective you take. Consider the table below, which compares the power consumption of various laboratory instruments.

Device	W per hour	W per day	Condition
CryoCube® F740hi ULT freezer	438	10,500	-80 °C, steady state
CryoCube® F570h ULT freezer	308	7,400	-80 °C, steady state
CryoCube® F440h ULT freezer	285	6,800	-80 °C, steady state
Centrifuge 5910 Ri	650	–	(1 h; 15,000 × g; 4 °C; 50 mL fixed-angle rotor)
Centrifuge 5430 R	610	–	(1 h; 20,000 × g; 4 °C; 30-place fixed-angle rotor)
Centrifuge 5427 R	370	–	(1 h; 20,000 × g; 4 °C; 24-place fixed-angle rotor)

Table 2: Comparison of power consumption (in watts [W]) per hour and per day for different laboratory instruments (sources of data: ULT freezer – independent external testing agency; centrifuges – internal measurements).

Constant improvements

Generational changes in product development foster progress in saving energy. The former HEF U570 freezer was already one of the most energy-efficient units in the field. The current CryoCube F570h needs 17% less energy per day (7.4 kWh instead of 8.9 kWh). This improvement saves 548 kWh/year, lowers annual power costs by 115 € and 0.15 t less CO_2 due to less required power*. Upscaled to an average usage time of 10 years, you can save more than 5,000 € and 1.5 t CO_2 by using the new generation of ULT freezers. Limits on realizing further savings do, however, exist as temperature performance and fast recovery after opening the freezer door are mandatory for safe sample storage.

* Energy-savings calculation (230 V): Average cost per kWh: 0.21 € (EuroStat 2019); www.eea.europa.eu; CO_2 savings calculated on the basis of 275 g CO_2/kWh (www.eea.europa.eu, 2019).

ACT. The Environmental Impact Factor Label

ENERGY STAR PARTNER

-70 °C instead of -80 °C

For decades now, the recommended long-term storage temperature for biological samples has been -80 °C. Discussions about changing the freezer set point from -80 °C to -70 °C to save energy have recently begun. Up to now, there has been no clear indication if the temperature change would or would not harm samples. What is clear is that a 10 °C change would not impact the majority of samples.

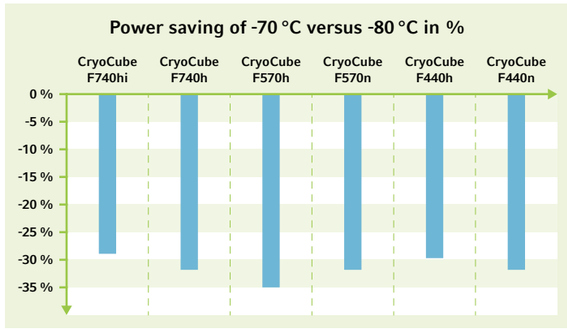


Figure 2: Average energy savings of about 30% can be realized when changing the set point from -80 °C to -70 °C on a CryoCube ULT freezer. The data are based on Eppendorf-external tests with three empty units (230 V) in parallel and 20 °C room temperature.

Centrifugation

Spinning requires powerful motors as well as efficient cooling as samples need to remain at the right temperature. Still, centrifuges can save energy:

> ECO shut-off function: Switches off the continuous cooling function on refrigerated models after a period of inactivity (usually 1, 2, 4, or 8 h) to lower overall energy consumption (such as 37% less energy used overnight for Centrifuge 5430 R) and extend the compressor's lifetime.

> Standby mode: Places the centrifuge in sleep mode (like switching off the display) after a defined period of inactivity.

> Reduced weight: The fixed-angle rotors of the Eppendorf multipurpose centrifuges (50 mL conical rotors and larger) are hollowed out and therefore lighter. This makes the centrifuge easier to handle and saves energy during ramp-up.

Liquid Handling

Electronic pipettes and dispensers require electricity. Multipette®/Repeater® dispensers and Eppendorf Xplorer® pipettes are equipped with rechargeable Li-polymer batteries which supply enough energy for up to 1,400x dispensing steps per charge. Parallel charging and pipetting are possible. If the capacity of the battery is worn out, the battery can easily be replaced by the user.

White Paper 75: "Independent ULT Freezer Checks – Third-Party Test Methods"
www.eppendorf.com/white-paper-75

Reuse Today

Limit your resource consumption
Fossil oil-based plastic vessels are an essential tool in laboratories around the world. The raw materials used to make these vessels have a downside in terms of sustainability.

We have succeeded in finding a convincing alternative to oil-based plastic: ISCC PLUS-certified polypropylene based on **renewable, reused** raw materials are now being used for the first time in a new generation of 5, 15, 25, and 50 mL Eppendorf Tubes® BioBased.

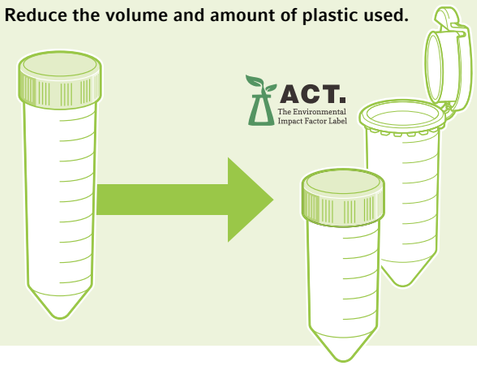
Reduce Today

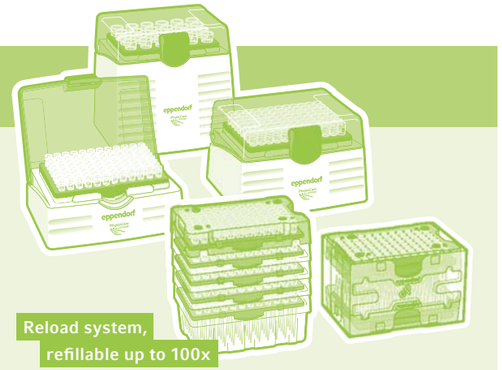
New rack design saves up to 35%[1] PP[2] material

[1] Savings have been achieved compared to predecessor model from Eppendorf.

[2] PP = Polypropylene

Reduce the volume and amount of plastic used.





Reload system, refillable up to 100x

up to 20%[1] PP[2] saved for 25 mL tubes with screw caps

up to 26%[1] PP[2] saved for 25 mL tubes with snap caps

up to 33%[1] more space in ULT freezers like the CryoCube® F740hi using 25 mL tubes with screw and snap caps

Recycle Tomorrow

How far can we go? Safety first
Despite the need for improved sustainability, laboratories are in a special situation: They have to focus on the safety of their employees, combined with safety of the samples being tested.

The biggest hurdle to recycling laboratory waste comes from the strict safety rules imposed on laboratories by many countries. These rules specify that such contaminated waste as laboratory consumables must be incinerated.

Poster: "How to Become More Sustainable in Your Lab":
www.eppendorf.com/poster-sustainability

White Paper 72: "Laboratory Waste – Immutable Fact of Life, or Opportunity for Change?":
www.eppendorf.com/white-paper-72

Since oil-based plastic vessels have replaced glass vessels, they have become an indispensable tool in laboratories around the world. Plastic vessels meet the high quality standards required in today's increasingly demanding research work. This means they pose a growing challenge to achieving sustainability.

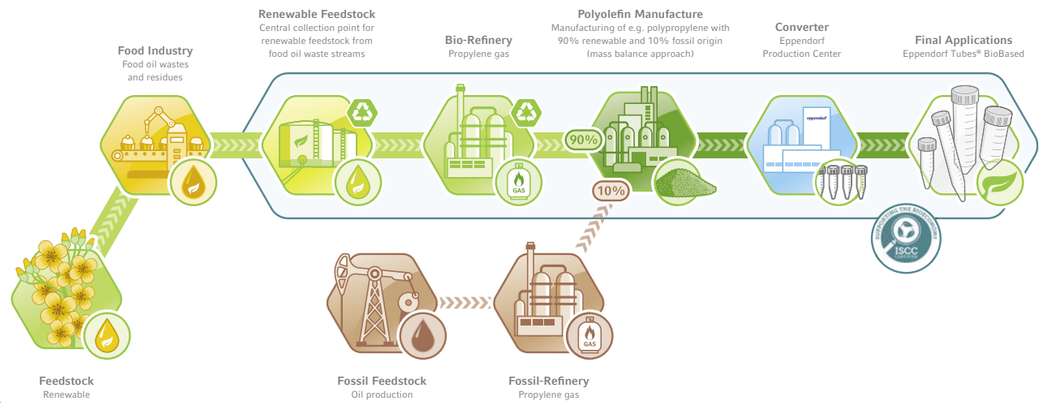
To overcome this challenge, Eppendorf has developed new, more environmentally friendly manufacturing materials. For the first time we can now offer a new generation of Eppendorf Tubes® BioBased. Our tubes feature screw caps in 5 mL, 15 mL, 25 mL, and 50 mL that are made from a certified polypropylene that uses renewable, reused raw materials.

2nd Generation Feedstock – 1st Class Consumables

In the specific biobased polymer production process used for the new generation of Eppendorf Tubes, fossil raw material is saved by replacing it with sustainable raw material produced from biobased waste and residues (2nd generation renewable feedstock).

> The raw materials used to produce the renewable feedstock can be traced back to their initial collection points. The renewable feedstock itself is sourced from a carefully selected group of suppliers committed to sustainability.
> ISCC PLUS provides an opportunity for all market participants – including manufacturers from the food and feed, chemical, pharmaceutical, and bioplastic industries – to obtain sustainability certificates. Certified companies ensure that each step in the entire supply chain, from agriculture to the finished end product, has been audited.

Examplary visualization of manufacturing process



> The final polymers are certified by "ISCC PLUS" (International Sustainability & Carbon Certification) – the reliable global leading certification scheme for manufacturers producing bio-based polymers and their further processing.
> Tubes* are made using 90% "bio-circular" renewable-based feedstock (recycled, for example, from food oil waste and residue) plus 10% fossil-oil-based feedstock (applying ISCC's mass balance approach).
> ACT labeled – Environmental Impact Factor certification initiated by My Green Lab®. More information: **https://actdatabase.mygreenlab.org**

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* The screw caps are actual fossil-based material. The material switch will be made to BioBased in 2023

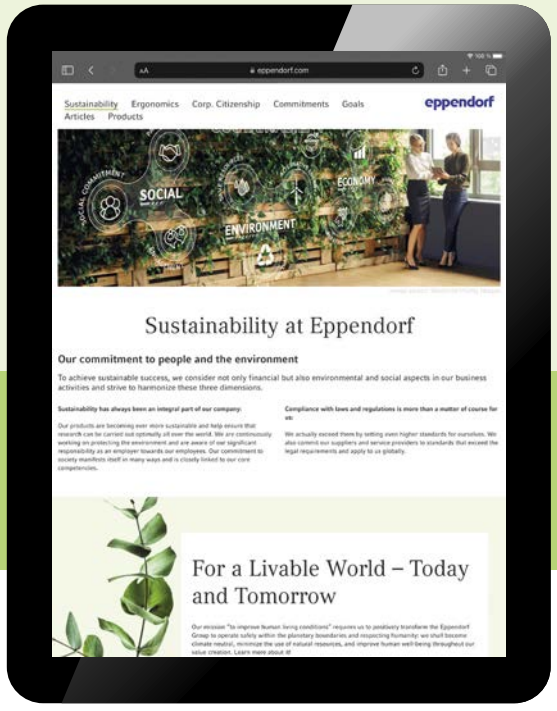
Discover more about biobased consumables:
www.eppendorf.com/biobased

White Paper 78: "Consumables Made of Bioplastics Enter the Lab":
www.eppendorf.com/white-paper-78

For a Livable World – Today and Tomorrow

Analyzing and improving sustainability issues requires knowledge and intensive work. None of the sustainability challenges we face today can be solved quickly or easily. But they all require manufacturers and customers to listen to each other and work together. This work is never over; it's an ongoing journey in which we remain in constant dialogue with our stakeholders.

Learn more about sustainability at Eppendorf:
www.eppendorf.com/sustainability



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