

TRIO

life











magazine no. 19



Sustainability.

Sustainability is the future.



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## Sustainability is a matter of attitude.

Sustainability may have become a household word, yet most of us are probably struggling to come up with an exact definition. We may have a vague idea what it means, but there's usually plenty of room for interpretation. So what exactly is sustainability? Where did the concept originate? What are sustainable actions? Why are businesses committed to sustainability? These are the questions we are trying to answer in this edition of TROX life. Sustainability has a lot to do with climate change. Finding ways to stop or at least slow down the climate change is in fact the main aspect of sustainability. And it's about time, because one of the factors that have led to the coronavirus pandemic is the ecological imbalance caused by human beings. Businesses are, at last, understanding the problem. One of them is the world's leading investment manager BlackRock, and BlackRock is increasingly pushing sustainability. The climate change has become a decisive competitive factor for the future success of businesses. A sustainably acting business, however, will go further. TROX, for one, has committed itself to becoming carbon neutral by 2040 at the latest: carbon neutral production, installation, distribution and action. How? Mainly by developing and enhancing efficient systems and by finding innovative solutions, such as the radio based control system RadioDuct.

Sustainability goes beyond carbon neutral production, though. It means making products that can be repaired when broken, it means reusing raw materials and organising logistics as energy-efficiently as possible, and it means a leadership culture committed to sustainability.

Sustainable action is reflected in many details, such as:

- our canteen buying locally grown produce (to avoid long-distance transports), preparing meals without wasting energy and avoiding disposable plates and cutlery
- using energy-efficient or alternative drive company vehicles
- using trains for business trips and skipping non-essential business trips in favour of video conferencing
- each individual employee's acting and behaving sustainably
- avoiding waste, and sorting and separating waste that cannot be avoided
- printing this magazine on paper without any synthetic substances

Indoor Life Quality is our top priority. Healthy, efficient and clean air distribution technology ensures:

- increased well-being (one of the 17 sustainable development goals of the UN) and quality of life
- a lower risk of infection and hence fewer sick days
- higher performance thanks to less contaminated air
- increased energy efficiency thanks to intelligent systems
- And not to forget: Our online customer portal ensures efficient design, ordering and cooperation on construction sites as well as more efficient procedures overall

We can meet this challenge only by working together. It is up to us. It is our responsibility to develop solutions to meet this all-encompassing challenge.



Yours

Udo Jung  
 TROX Board of Management





It's a ubiquitous word for our generation. Sustainability. Everyone is talking about it. Everywhere. All over the media.

# So what actually is sustainability?







### Sustainability.

Sustainability is a principle that governs the use of resources. It is about guaranteeing that needs are met in the long term and therefore preserving the natural regenerative capacity of the systems involved – most notably, living things and ecosystems.

The concept of sustainability was first described in 1713 in a German work called 'Sylvicultura oeconomica' by Hans Carl von Carlowitz. It meant making only such use of natural, renewable resources that people can continue to rely on their yields in the long term, and it primarily referred to forestry. *Source: Wikipedia*

### Sustainability in the modern economy.

Sustainability has become an important selling point. However, very few products come with a lifetime guarantee. What generally sets these products apart is their longer service life, which is all down to the use of better quality materials and production processes.

Sectors that maintain short product cycles and often visually age their products through design and model upgrades often focus more on sustainability in terms of production and disposal, rather than the products themselves – smartphone manufacturers are a key example here.

An economy that develops products with planned obsolescence is dubious when it comes to sustainability. These are either made as modified variants or promoted with new product features – or they are designed to 'age' over time.

Very few companies actually aim for longevity. Household appliances manufacturer Miele is the only company in that industry to test its washing machines, dryers, dishwashers, ovens and other products for a 20-year service life. Tool manufacturer STANLEY also markets its products as being built for life.

Companies rarely stock replacement parts beyond the warranty period. As a result, a repair generally costs more than the market value of the product. To counter this for high-price goods, a market has developed that uses engineering to determine faults with wearing parts and to provide replacement parts that are better than the originals. The same applies to old products that have proven their reliability over a long period of time and are easy to fix if a repair is required as they are less complex. There are also private initiatives, such as repair cafes, that offer similar services.





# The mountain is calling. For greater sustainability.

Humans are interfering with the balance of nature, even in the most remote paradises, such as the Maldives or on Mount Everest. Two extraordinary examples. Sustainable measures to turn back the clock are being sought desperately – and this often results in remarkably simple but effective solutions.





*Increasing tourism in the Mount Everest region is accompanied by a serious rubbish problem.*

Because of the increasing problem, the Nepalese government now even wants to mobilise the army to clear up the 35,000 kg of rubbish from Mount Everest. 'We are learning from our mistakes and working hard to clean up the mountains, even in the higher areas', explains Bigyan Dev Pandey, spokesperson for the Nepalese army. The campaign is expected to cost almost 7 million euros.

However, the Sherpas can see a problem. Phurba Tashi, the famous Sherpa who has climbed Mount Everest 21 times, does not think that soldiers will be able to do clean-up work at the higher altitudes. 'It is really hard to carry heavy oxygen bottles or frozen bodies, which can weigh up to 150 kg, from high-level base camps.'

A 'penalty system' to clean up the mountain has failed. For many years now, mountaineers have actually had to bring at least eight kilograms of rubbish – the average amount caused by a visitor – with them when they come back down the mountain. A failure to do so means a fine of between 100 and 4000 dollars.

However, an expedition to Mount Everest costs participants 50,000 euros on average so the fine is small change for many wealthy mountaineers. As a result, the mountain of rubbish on Everest is getting bigger and bigger. In 2018 alone, China collected more than 8 tons of rubbish in one expedition.

**Rubbish mountain on Everest.**

It goes without saying that mountaineers love nature and therefore generally behave in a sustainable manner, even bringing their banana skins back with them. Nevertheless, mountain tourism has had an extreme impact, even on the highest mountain on Earth, Mount Everest.

Queues at the summit. Mountains of discarded oxygen bottles. Masses of poo bags, waste and broken tents. Unbelievable, but you can find it all in the Himalayas. Not to mention the numerous bodies uncovered by the ice over time.

**The Maldives are sinking in rubbish.**

The island gems in the Indian Ocean are in danger of sinking in rubbish. The Maldives were first developed for tourism in 1972. Today, they attract over 1.5 million tourists each year. However, this huge demand is leaving marks.

Inadequate rubbish separation is a global problem, but waste poses a particular challenge for small island nations such as the Maldives, the Seychelles and Barbados. They often lack the funds as well as sustainable disposal concepts.

When the Maldives first opened up to tourism, packaging was rarely made of plastic. The residents often disposed of organic waste in the sea. However, as tourism emerged and imports of food and household products began, all types of packaging – but mostly plastic – ended up in the group of islands and also in the sea.

Where should the new rubbish go? The government was overstretched. Eventually, from 1992 onwards, the ever-increasing rubbish mountain has been disposed of in a lagoon surrounded by a reef. The layers of rubbish were covered with sand to form an island with the highest elevation in the nation. Up to 1500 tons

of non-incinerated rubbish lands on 'Thilafushi' each day. Or at the bottom of the Indian Ocean – because waste removal companies simply throw the rubbish overboard to save transport costs.

Tourism is the biggest source of income for the island nation. The Maldivian government is therefore not trying to limit it to protect the environment. On the contrary, four new airports are meant to go into operation in 2020 alone.

*Even remote paradises such as the Maldives have to contend with a rubbish problem.*







**Initiatives to combat the mountains of rubbish.**

People are becoming more aware of the problem of growing mountains of rubbish and initiatives are being developed to combat these. 'Plogging' is a great example of this: originating in the Swedish capital of Stockholm, a man who was fed up with rubbish lying around started to pick up the waste while he was jogging. The name of the craze, which is seeing more and more imitations, is a combination of the words 'plocka upp skräp' (picking up rubbish) and jogging.

People are also becoming aware of the waste problem in emerging countries. Here, most of the measures to combat this are private initiatives. In the Indonesian city of Yogyakarta, a waste bank has been created. With this,

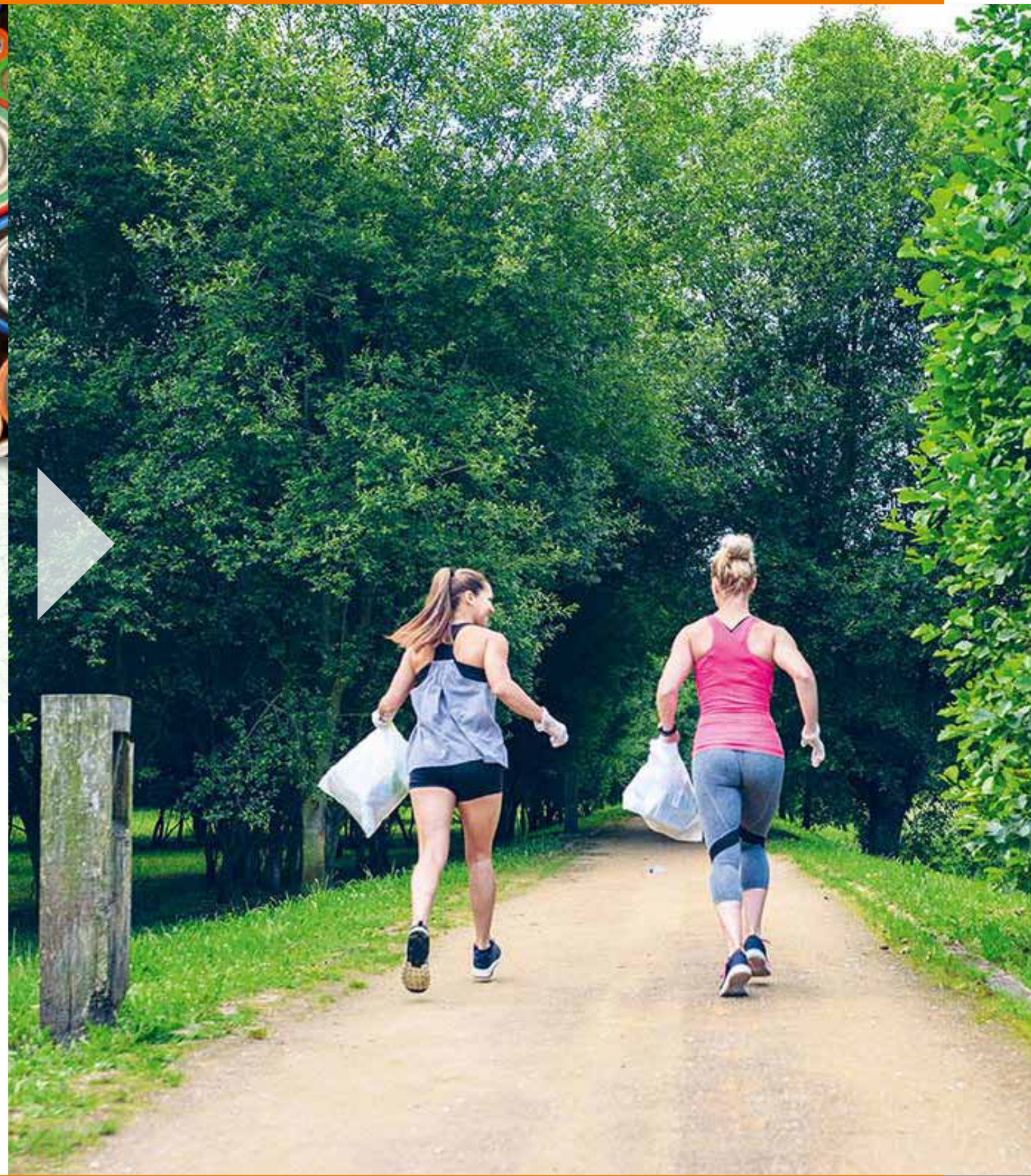
you pay into an account with cleanly separated and reusable materials. The equivalent value is recorded depending on the material and weight of waste provided and this then pays for a recycling factory. Plastic bottles, clean newspaper, metals and reusable batteries bring in the most and are returned into recycling processes.

Environmental engineer Bambang Suwerda came up with the idea of a waste bank in 2008. The university lecturer even set up a waste workshop on his campus where students could bring any possible materials for recycling.

Two of many examples that give us hope.



**#Plogging**





# Energy-efficient, demand-based lab ventilation.



In order to optimise the use of energy and thereby considerably reduce the operating costs of a lab, volume flow rates have to be reduced to the minimum that is feasible from a hygienic point of view. This is the way to make ventilation and air conditioning as efficient as possible.





The Swiss H.Lüdi + Co. designs and develops pioneering systems for the construction and equipment of modern labs.

**Requirements on lab ventilation.**

Ventilation and air conditioning are energy-efficient only if they meet the following requirements:

- adapting volume flow rates to demand, i.e. to room usage
- adapting fan speeds to the air requirement
- balancing supply air and extract air flows
- automatic balancing of volume flow rates
- minimising pressure losses caused by dampers
- communication of all system components
- smooth integration with the central BMS

A ventilation and air conditioning system that meets such high requirements is bound to reduce the energy consumption in labs.

**Significantly increased energy efficiency in labs.**

Prompted by an initiative by the Swiss company H.Lüdi, TROX and TROX HESCO Switzerland have developed an innovative ventilation and air conditioning solution that is bound to help achieve considerable energy reductions in lab buildings.

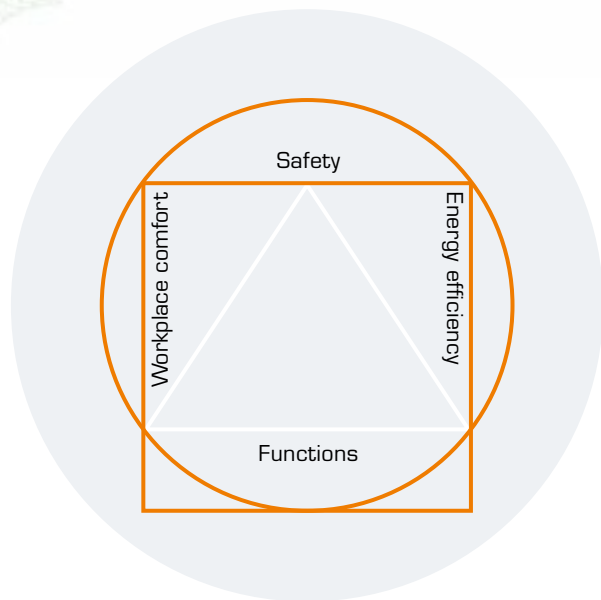
**Advanced system solutions for modern labs.**

H.Lüdi specialises in the development of advanced system solutions for the construction and equipment of labs. The company provides the well-known high Swiss quality and has been working with TROX GmbH for many years. When it comes to lab equipment, H.Lüdi is actually a pioneer and an innovator, be it with BIM, or Building Information Modelling, be it with their innovative modular equipment that facilitates and speeds up installation and assembly, or thanks to innovative ideas that lead to energy and cost savings.

Design, sizing and installation – H.Lüdi offers the entire lab infrastructure from a single source: electricity, water, gas, pipe networks and ventilation components, including wiring and interconnection. For ventilation components and systems, H.Lüdi has relied on TROX for many years.

**Turbulence-free airflow.**

A turbulence-free airflow creates layers of air that are free from draughts and stalls. The air in a space rises and takes heat loads and any undesirable particles to the upper part of the space, from where they are then efficiently removed. Only the occupied space up to 2.50 m has to be cooled with fresh air. This is yet another advantage of the removal of heat loads. An ideal air distribution strategy combined with a decentralised heating, cooling and ventilation system ensures that heat loads of up to 150 W/m<sup>2</sup> are dissipated.

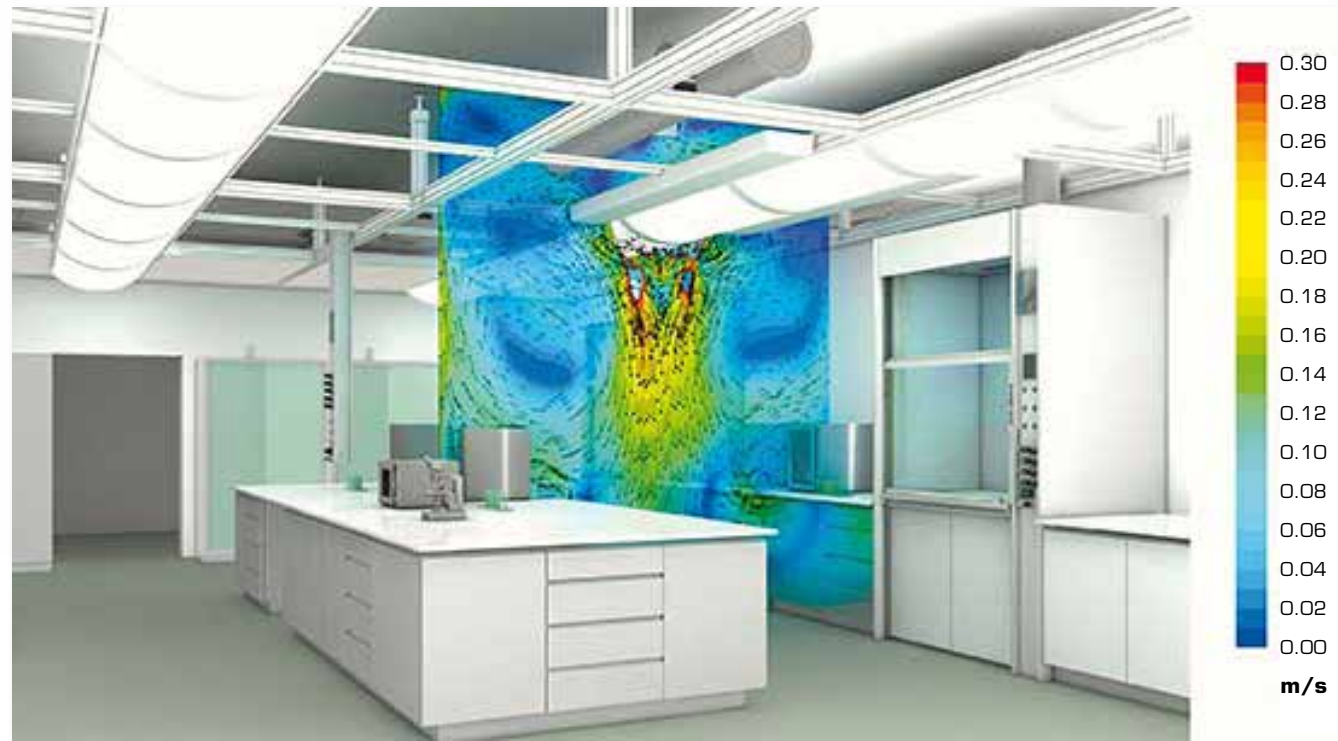


**Squaring the circle in ventilation and air conditioning.**

An air conditioning system must try to achieve a balance between effective air distribution, energy efficiency, and safety and comfort of the people in the workplace.



**Energy reduction of up to 30% – ventilation based on thermodynamic principles ensures maximum efficiency.**



H.Lüdi is committed to providing the best possible, energy-efficient lab equipment and furniture for the highest work comfort.

**Changing requirements on lab ventilation.**

Ventilation and air conditioning not only aim at providing comfort for room occupants; the more important aspects are actually safety and energy efficiency. High thermal loads have to be dissipated; with a conventional system, this requires huge quantities of fresh air.

This is why split units are often used for additional cooling. They do have a disadvantage, though: Cold air is blown into a space at a high velocity, and not through the supply air outlets, but against the airflow provided by the central system, thereby thwarting an ideal air distribution and dissipation strategy. Energy efficiency and thermal comfort suffer.

Years ago, most labs were so-called wet labs. They would require at least eight air changes per hour for an effective removal of chemical or other hazardous

substances and to protect the lab staff. These days, however, research in a lab focuses on other jobs, such as analysing the water quality or food analyses. Biotech labs are also very common. As a consequence, fewer and fewer fume cupboards are needed, or none at all, so that fewer air changes are required. Also, labs may not be fully occupied at all times, which is another reason for a lower fresh air requirement. Changing requirements lead to new approaches: fewer air changes when there are fewer fume cupboards because air that is extracted has to be replaced, i.e. supplied again. And this can be expensive.

Depending on the requirements, heat loads can be dissipated more efficiently and more comfortably than with conventional systems. Not to forget, intelligent control systems consider both occupancy and the number of currently active or inactive fume cupboards, so that less fresh air is required.

**The basic idea: simple, yet brilliant.**

- When a lower occupancy of labs and a lower contamination of the room air require less fresh air,
- when heat loads can be dissipated more efficiently and cooling could be more energy-efficient,
- when fume cupboards are integrated in an intelligent control network,
- when there are integrated sensors that forward information to each component and to the central BMS,
- and when components are designed for efficient air distribution and simple integration into the lab ventilation system, ...

... then a system should be used that combines supply air, extract air and recirculated air. Ideally, all these functions should be provided by a single unit that ensures an ideal air pattern.

Instead of a strategy based on supply air alone, the more efficient ventilation and air conditioning system is expanded by the following elements per unit:

- An air-water heat exchanger for supply air ensures that heat loads are dissipated more efficiently. Heating and cooling will be more efficient due to the ventilation system.
- An integrated, intelligent control system makes it possible to minimise the fresh air flow rate based on occupancy.

- Radiators, air heaters, split units, active chilled beams, cooling with recirculated air, and chilled ceilings or canopies are – in contrast to conventional systems – no longer needed and do hence not have to be balanced with one another. Much heating is usually not necessary in labs due to the high heat loads. However, if the difference between heating and cooling is small, adaption of the radiators will be slow and they may actually work against cooling.

All these varying requirements were taken into account, and an integration strategy for all the important functions has been developed. These functions are now included in one system that combines the hardware and software for heating, cooling, fans and sensors, and that meets the following requirements:

- reaction to varying demands (real demand based), with demand-based ventilation and air conditioning
- use of a heat exchanger that dissipates heat loads with water
- considering various pressure conditions, for example due to HEPA filters as they cause more pressure loss
- optional use of smaller and more energy-efficient EC fans\* in a UBox. Such 'supporting fans' ensure that the duct pressure can be reduced and that the air handling unit can run with less pressure and a lower total volume flow rate, i.e. that a smaller duct network may suffice. This also helps to save costs.

**In a nutshell: lab requirements today**

1. Smaller volume flow rates
2. Handling of high heat loads
3. Prevention of cross contamination
4. Heterogeneous environments
5. Comfortable usage

\* The EC fan (EC = electronically commutated) is driven by a brushless DC motor. Such motors use a permanent magnet in the secondary field. DC running through the wire winding creates a magnetic field, providing the power which runs the motor. This is more efficient and saves up to 70% of energy.



**EASYLAB – UBox: everything included.**



- 1 Temperature sensor
- 2 Volume flow rate sensor
- 3 Differential pressure measurement
- 4 Non-return damper
- 5 Secondary air filter
- 6 EASYLAB control system
- 7 Heat exchanger
- 8 Patented supply air sound attenuator
- 9 EC fan
- 10 Patented extract air sound attenuator

*Preassembled and complete – the UBox (U = Umluft, or recirculated air): everything from an EC fan and sound attenuators to heat exchangers, filters and an intelligent control system with sensors.*

All these considerations found their expression in the so-called UBox, which TROX and H.Lüdi developed for lab ventilation and which has just been installed in a Swiss lab for the first time. Depending on how much fresh air is required for a zone, the UBox takes in more or less room air, which is then mixed with the fresh air and supplied to the room again. Heat loads are efficiently dissipated with water thanks to the integral heat exchanger. The smart EASYLAB control system controls supply air and extract air flow rates based on demand. EASYLAB also controls pressure conditions if several rooms have to be kept separate with different room pressures.

The UBox can simply be integrated with an existing system and ensures that thermal loads are dissipated safely, efficiently and comfortably.

The reason the cooperation with TROX has been so successful', explains Hansjürg Lüdi, 'is because we have the same method of approaching problems and we are both committed to finding the best possible solution. The technical support was excellent, the intelligent products and especially the EASYLAB control system have allowed us to achieve a system in which the components are working together perfectly.

We were convinced of our idea and had the courage to follow through with it and install this system for the first time. We expect a considerable reduction of the life cycle costs and hope to reach the break-even point soon.

**CROFCU – what was that again?**

In a joint project with Daldrop + Dr.Ing.Huber a few years ago, TROX developed CROFCU, a system similar to the solution introduced here. Daldrop + Dr.Ing.Huber specialise in clean room systems, and X-CUBE CROFCU, which works with another control system, allows for considerable energy savings in the ventilation of clean rooms. For more information please refer to TROX life 'Clean room air'.

**Conclusion.**

- Up to 50% reduction of energy consumption when compared to existing solutions.
- More comfort thanks to the ideal air discharge and distribution.
- Easy connection of the ventilation system to the central BMS with plug and play.





# Circular economy and sustainability.



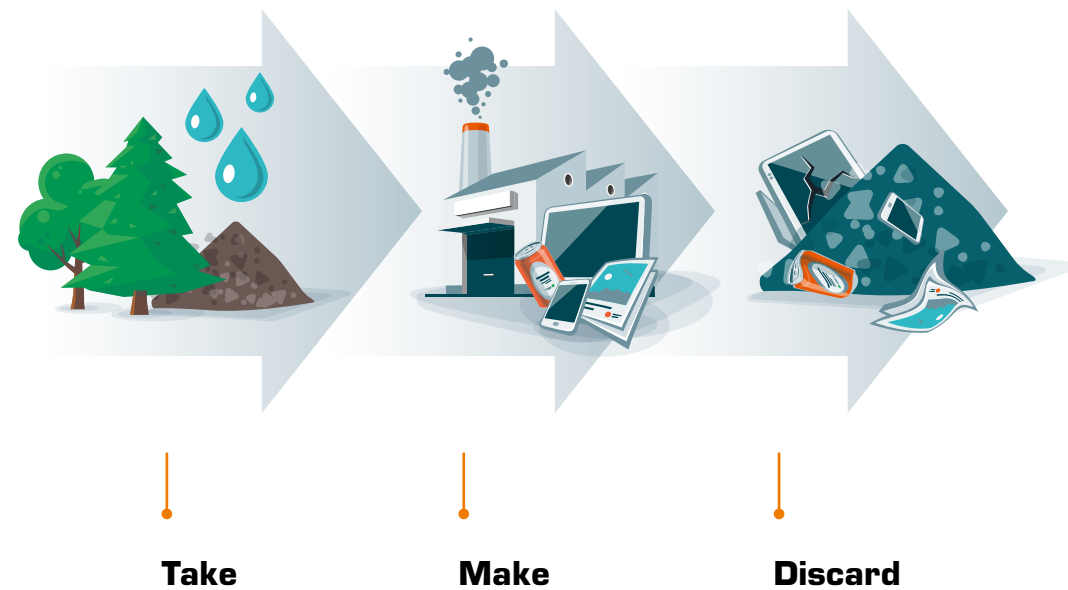
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A circular economy is a regenerative system that reduces the use of resources, waste production, emissions and wasted energy. This can be achieved with durable construction, regular maintenance and repair work, as well as reusing, remanufacturing, refurbishing and recycling.

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Linear economy



Circular economy



Linear economy.

The opposite of a circular economy is the linear economy (also known as the throwaway economy), a prevailing principle of industrial production to date. A major share of raw materials goes to landfill or is burned after the respective period of use, with very little being reused.



The circular principle.

The basis of the circular principle is recognising that only production processes with a closed cycle of material management can be continued without restriction in a world with finite resources. Non-renewable raw materials, such as oil, are finite and will be used up as a resource in the foreseeable future. The circular economy is modelled on the material cycle of nature and tries to achieve cascading without waste and emissions.

Even in 2005, the material flows of the global economy amounted to approximately 62 billion tons. 58 billion tons originated from newly extracted raw materials, with just 4 billion tons (6%) coming from recycled goods. 44% of the total material flows (28 billion tons) was used to generate energy, particularly fossil energy transfer mediums that are depleted when used. It is not possible to recycle these. As a result, the change in energy policy is an important prerequisite for achieving a circular economy, especially the switch from fossil fuels to renewable energies.



**History of the circular economy.**

Early human economies, which are still present in traditional agricultural systems in developing countries, were always based on a circular system. Waste products, such as excretions and cooking waste, as well as production residues, such as straw and ash from using fires to clear land for plantation, were fed back into the production cycle, i.e. 'recycled'.

The concept for the modern circular economy was introduced in 1990 by British economist David W. Pearce. The aim is to minimise resources and to use cleaner technologies.

In Germany, a Circular Economy Act was adopted in 1994; it is designed to promote recycling and other ways of reusing waste materials. According to William McDonough, the circular economy aims at eco-effectiveness. It is important to either return products back into biological cycles as biological nutrients or to keep them continuously in technical cycles as 'technical nutrients'.

New technological solutions, such as 3D printing, could help with the breakthrough of the circular economy by transforming the supply chain, particularly by using reused plastic waste to produce new goods locally and to produce smaller batches.

**Economic benefits.**

A study by the Ellen MacArthur Foundation estimates that the circular economy could increase resource productivity by 3%, along with cost savings of 600 billion euros by 2030 and economic gains of a further 1.2 trillion from other areas.



**Measures in the circular economy**

**Regenerate**

Re-establishing and then maintaining the health of our eco-systems by using renewable energies and materials and constantly returning biological resources to their natural roots – the ground.

**Dematerialise**

Thanks to digitisation, buying and listening to music has mostly become an online thing and no longer requires materials or packaging. However, it is worth bearing in mind that digitisation very often causes emissions due to high energy requirements, e.g. with streaming.

**Reuse**

Recycling and upcycling products, parts and materials.

**Optimise**

Increase the efficiency and performance of products by improving quality, service life and compatibility, as well as by shaping the entire supply chain in a sustainable, cycle-oriented way.

**Replace**

Old, ecologically inefficient production mechanisms, business models and technologies are replaced by modern, cycle-based alternatives.

**Share**

With concepts such as launderettes, car sharing and second-hand businesses.

**Repair**

Extending the useful life of defective goods with repair work.





**Professor Hans Fleisch**  
Chairman of the Foundation Council of the Heinz Trox Foundation; member of the Supervisory Board of TROX GmbH

# TROX Round Table. Sustainability.



**Ralf Joneleit**  
Head of Technology and member of the extended Board of Management of TROX GmbH; chairman of the building services advisory board of the German Association of Engineers



**Marlehn Thieme**  
Member of the Foundation Council of the Heinz Trox Foundation; chairwoman of the German Council for Sustainable Development until 2019

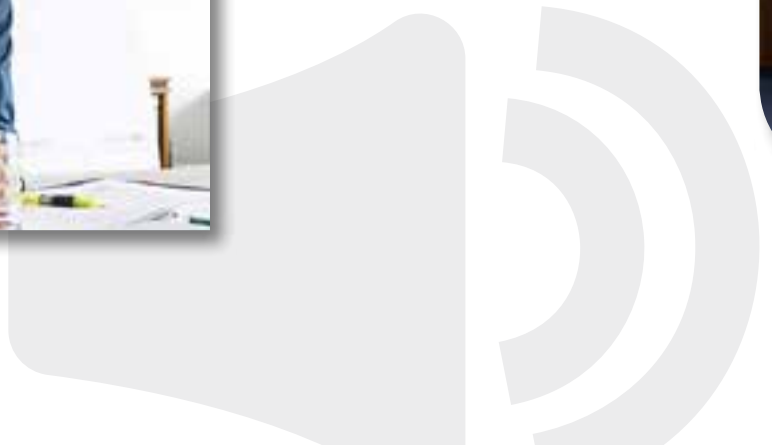


**Udo Jung**  
Member of the Board of Management of TROX GmbH; member of the board of directors of the German Building and Climate Industry Association, of the German Mechanical Engineering Industry Association, and of the Research Association for Air Distribution and Drying Technology



TROX recently hosted a round table discussion with renowned sustainability experts and members of the Board of Management. The event was held via video conference due to the COVID-19 pandemic. At the event, participants passionately discussed the various aspects of sustainability and its implementation in the company and with customers.





**Where did the idea behind this exchange of views come from?**

Professor Hans Fleisch: 'We have dealt with this subject on various occasions in the Foundation. The incentive to approach it more proactively was the Board of Management's strategy meeting a while ago.'

'In fact,' agrees Udo Jung, 'in this meeting, we looked in detail at the areas in which and the way in which sustainability and sustainability projects can be defined and implemented in light of this key trend. Since we have got to work on this, we have already been able to show lots of positive results in favour of sustainable development and have started numerous projects in the company.'

'There were lots of things behind it, not just one', adds Ralf Joneleit. 'The subject of energy efficiency has played an important role here for a long time now. With our high-quality products, we try to win people over with the life cycle costs. The subject of energy efficiency has largely been exhausted. Now, resource efficiency and the implementation of the system philosophy are coming more to the fore. Other ideas encouraging us to address sustainability are coming from our workforce and from young people whom we want to attract.'

**Does the notion of a foundation imply sustainability?**

Professor Hans Fleisch, chairman of the Heinz Trox Foundation since 2015, has dedicated almost his entire professional life to foundations. He therefore believes that a foundation represents another aspect of the sustainability concept in itself. The Heinz Trox Foundation ensures the existence and sustainable development of the company, the jobs, and the mission of Heinz Trox: The human being is the yardstick, and people's well-being is our goal.

**Acting sustainably is part of the DNA of the Heinz Trox Foundation.**

Marlehn Thieme endorses this idea: 'I am the latest member of the TROX family and would like to contribute towards further developing the strategic approach to sustainability in the company.'

'With a family company or an owner-run company, there is a special kind of responsibility', Marlehn Thieme knows from experience. 'This was also clear with Heinz Trox: he was very much aware of and focused on his responsibility and wanted to continue his life's work in the form of the Foundation. He implemented his core beliefs in the company in such a way that they have left a noticeable mark. He focused the company on innovations and long-term development, not just maximising profits in the short term.'

**What are the most pressing questions in terms of sustainability?**

Marlehn Thieme: 'Economic systems that cause high CO<sub>2</sub> emissions, the growth of the global population and the increasingly apparent scarcity of resources are bringing about a new type of corporate responsibility that is directed towards sustainability and includes ecological, economic and social dimensions.'

**What is the significance of sustainable leadership?**

'Sustainability in communicating with other people is a subject we have been discussing extensively', explains Ralf Joneleit. 'For me, it is important to define and describe the values and to communicate with our employees. By doing so, we know how we want to work together sustainably in the future at TROX. That's our aim.' According to Ms Thieme: 'Sustainability is not just about protecting the company – it also needs to serve the people. The economy is there for the people and not vice versa.' 'Our employees stay with us for a long time compared to other companies, which proves that TROX is not doing badly in this respect', adds Ralf Joneleit.

Marlehn Thieme adds: 'The basis for such a development is certainly a culture committed to high values and also a broad consensus about a company moving into this direction. What we need are strategies that aim to reduce CO<sub>2</sub> emissions, create faultless supply chains and improve employee training and motivation.'

**And what about sustainable customer relationships?**

'I believe', explains Udo Jung, 'that when sustainable, trusting customer relationships have been developed over many years, as at TROX, the customers reflect that to us. Recently, we have won several awards where trust and sustainability play a major role.'







is one of the largest single orders in Germany and shows that TROX is on the way to being very sustainable from a strategic perspective. A sustainable project such as this only works with investor models that work in the same way.'

**Do you also check suppliers' sustainability credentials?**

'With suppliers, we pay attention to the role of resource efficiency', explains Ralf Joneleit. 'Which materials are used to make what? It's something that needs to play an even greater role in future.'

We are currently revising our conditions of purchase and one prerequisite is to provide certain material-related information that will allow us to create an environmental product declaration for the product as a whole. We have many larger suppliers, whom we regard as partners, with whom we are working together to forge ahead with joint development projects, and who are committed to sustainability, energy efficiency and resource efficiency from as early as the development phase.'

Udo Jung adds an example: 'Together with our motor manufacturers we have developed a diagnosis system for smoke exhaust fans that allows for maintenance based on the actual condition of a fan. This saves airports, for example, millions and increases the service life of the smoke exhaust fans without compromising on safety.'



'We must not waste this recognition and this vote of confidence we have gained, nor the excellent results from the satisfaction analyses', Ralf Joneleit emphasises how important this is to him. 'Making short-term deals, for example in the current coronavirus crisis, is not part of our philosophy – our customers recognise and value the sustainable way in which we work together.'

'Coming together to discuss sustainable solutions is something TROX does already today to involve its customers', explains Professor Hans Fleisch. 'In addition to long-term relationships based on trust, we also need to develop joint solutions. Things such as this are getting increasingly important, and the fact that TROX is making a real effort and has something to offer will increase the company's profile further. In addition to excellent quality and energy efficiency in systems, sustainability is becoming more and more valued. This will benefit TROX.'

Udo Jung expands on the significance of the system approach for customers: 'In 2017, TROX acquired the company HGI which, in addition to carrying out the building automation design work, subsequently also took on the entire TROX system service, thereby linking the components nicely. HGI now builds the switch cabinets for the German market and installs central building management systems. For an investor in a hospital in southern Germany, this was one of the key deciding factors for working with TROX. In addition to the central building management systems, we also supply air distribution technology components, fans and, last but not least, air handling units. The project



**In which direction are you heading in terms of sustainability with future products and services at TROX?**

'With RadioDuct', enthuses Udo Jung, 'we have developed a patented product together with RWTH Aachen University that is also supported by the state and federal governments. In future, we will be able to transmit via radio through the ventilation duct – and will be the only manufacturer to be able to do so. Where you previously had to drag long cables through a building, you can now install sensors and their information is transmitted from the components to the air handling system via radio to control it. The result is that you get to keep existing components, use less material, have the option to retrofit and can therefore implement energy-efficient systems in existing buildings.'

Udo Jung: 'When I produce something sustainably, people have to be able to experience the outcome with their senses.' This could be with a green roof or a display showing the energy CO<sub>2</sub> saving. Producing sustainably is one thing, but making sustainability perceptible and transparent is also important. We can therefore include customers, partners, suppliers and, last but not least, employees accordingly. As a result, the subject is part of the company's DNA.'

**What about sustainability in terms of geographical mobility, transport and logistics?**

Ralf Joneleit: 'Our locations now very often use reusable packaging. With a large project in Norway, TROX transported products to the building site in reusable packaging, reduced packaging material and delivered just in time in line with the construction progress. We manufacture at lots of different locations in Europe so are therefore closer to our customers. This is more favourable from a sustainability perspective than travelling long distances.'

The coronavirus situation has taught us that certain aspects of mobility are perhaps not as essential as we once thought. Video conferences such as this one today are the best example. There's also our online platform for training, as well as our online seminars. Replacing the journey to see customers, to travel between locations or to visit subsidiaries with video conferences is an important way of reducing CO<sub>2</sub> through our transport activities. Even so, personal contact is just as important to us as ever.'







**What are you paying attention to in areas such as infrastructure, water, energy and durability?**

'Some of our buildings are already very sustainable as they use geothermal energy', explains Udo Jung. With regard to water, he adds: 'In production processes such as powder coating, a lot of water is circulated. There are a few treatment plants that process the water so that it can be used several times.'

According to Ralf Joneleit: 'Some great ideas have been emerging since we introduced environmental management and energy management alongside our quality management system. This is where these very issues arise. How can we reduce power consumption, water consumption, etc.?'

**And what about sustainability from a social perspective?**

Professor Hans Fleisch: 'Any profits that are not reinvested go to the Foundation to support a wide range of social projects and facilities as well as science. Heinz Trox always had a tradition of donating to different causes, which we have continued to some extent with the Foundation.'

'Education is also part of this', believes Ralf Joneleit. 'TROX is doing its bit here at the different locations. There is a particular emphasis on vocational training.' He believes that many students who are supervised or supported with various projects make a real difference.

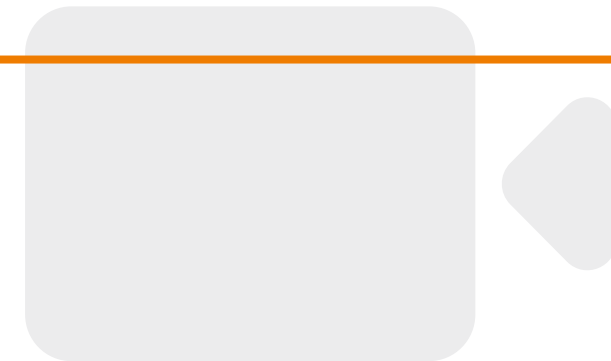
**Is the sustainability of the entire value chain considered?**

'The life cycle costs are extremely important to us', confirms Ralf Joneleit. 'Due to their quality, TROX products are long-lasting but not the cheapest. However, if you consider the entire life cycle, they are often the most economical and best alternative from a monetary perspective. And from an energy-related and sustainable perspective for that matter.'

**A sustainability ethic in the value chain. What anthropological concept is behind this?**

Professor Hans Fleisch: 'I think that there's a starting point for us all, and it's human dignity. The Federal Constitutional Court said that humans must never become mere objects. That's a good place to start, and it goes hand in hand with Heinz Trox's guiding principle: The human being is the yardstick, and people's well-being is our goal.'

Ralf Joneleit gives an example of how this is embedded in company life: 'About a year ago, we launched the TROX ideas platform. We are getting ideas from all over Europe. Lots of ideas where people are clearly thinking outside the box. In Beijing, where the outdoor air is not so good, someone came up with an air conditioning solution – why not use the extract air from the buildings? It is considerably better than the outdoor air and could be used to air-condition certain outdoor areas.'



**So what exactly is special about TROX?**

Marlehn Thieme: 'Openness and a quest for innovation are part of our company's DNA. This spirit and its essence must always be developed, cultivated and fed back further. This means that people who try to give their best get a sense of validation.'

Professor Hans Fleisch believes that this spirit is something special. He associates TROX with quality in the broadest sense. It is not just about the quality of the products, solutions and processes, but also in terms of investing in developing employees' skills and in sustainability, as well as the great sense of responsibility from a social perspective.

Udo Jung agrees with the other speakers: 'For me, it's the trust that people both inside and outside the company have in the TROX brand. A sign of this is and has always been our participation in and the feedback from our ISH appearances. Here, we have developed to become the hub of our sector. Together with our customers, partners, suppliers and employees, we are a community that makes me proud.'



**What are your personal final thoughts about sustainability?**

'I think a lot of what TROX has achieved is already quite impressive,' says Marlehn Thieme, 'but that's not to say that we can't do better.'

'Sustainability always comes down to the workforce', believes Professor Hans Fleisch. 'Not just in terms of employee training and diversity, but also in terms of management – TROX is largely incredibly well-positioned in this respect, but not quite in all areas. It's people that matter. That applies in two respects.'

'Another matter is credibility', explains Udo Jung. 'It is extremely important to me that all aspects of our sustainability projects are credible and that we do not create a framework that we will not be happy with further down the line – this is also something I am going to look at personally.'

'Sustainability starts with the small things and with every individual', believes Ralf Joneleit. 'If everyone pays attention to sustainability matters, we have already made a huge step forward.'

'Exactly,' agrees Marlehn Thieme, 'it is already starting with the canteen food: using regional products, avoiding packaging and preparing meals in an energy-efficient way.'

**Thank you to everyone involved for the interesting discussion.**





**Greater sustainability thanks to unusual recycling ideas.**

Resource scarcity and waste have inspired a change in thinking and given rise to completely new recycling ideas. Here are a few of the more unusual ones, such as beachwear made of recycled fishing nets.







**CO<sub>2</sub> as a raw material.**

Researchers at the Max Planck Society, RWTH Aachen University and Covestro AG have tapped a new raw material for the chemical industry: the greenhouse gas CO<sub>2</sub>. This makes it possible to replace crude oil to some extent. They have developed a process with which Covestro AG can manufacture up to 5000 tons of polyols per year in a pilot system. Other companies use this substance to make polyurethanes, which are then used as foams in mattresses or as adhesives in gymnasium floors. Polyurethanes also have numerous other uses, for example as flexible foams in car seats or hard foams in insulation materials.

The jury for the German Future Prize was so impressed with this innovation that they awarded it first place.

**Kerosene from CO<sub>2</sub>.**

The Fraunhofer Institute for Molecular Biology and Applied Ecology in Aachen uses a mixture of CO<sub>2</sub>, carbon monoxide and hydrogen – the emissions created by steelworks – to produce kerosene.

The researchers ferment the gases into alcohols and acetone using genetically modified bacterial strains, transform both substances catalytically into a diesel-like intermediate product and produce kerosene and special chemicals from this. The patented processes currently works on a laboratory scale.

**Oil from ground coffee for cosmetics.**

Three Columbians in Copenhagen collect coffee waste from hotels, offices and cafes to reuse the healthy ground coffee, as approximately 90% of the constituents remain in the grounds after the drink has brewed. From these remnants, they get oil and a kind of flour, which can be used to make cosmetics. They also want to produce a gluten-free flour that can be used for bread. The trio from Kaffe Bueno got their unusual idea from Juan Medina's grandmother, who used to put coffee on small wounds because of the coffee's healing properties.

**Sustainable beachwear.  
Bikinis made from fishing nets.**

40% of plastic waste in the oceans comes from fishing nets that have been torn off or disposed of. Now, the fishing nets are being recycled to make eco-friendly beachwear. More and more labels are producing sustainable bikinis, swimsuits and swimming trunks – and they look great.

**Prostheses made from recycled plastic.**

Industrial designers Fabian Engel and Simon Oschwald from the Zurich University of the Arts (ZHdK) developed a process for their final project that makes it possible to make leg prostheses from recycled plastic cost-effectively. These are expected to be used primarily in developing countries. While demand in those countries is high, often due to landmines, most people cannot afford the usually very expensive prostheses.

This unusual idea was sparked by the major problems posed by vast amounts of plastic waste and a lack of recycling systems in developing countries. Therefore, the two students considered how they could effectively utilise this 'resource' and started developing prostheses from it. Since then, they have made their project into a business model and are in the founding phase with Project Circleg.







**Wood substitutes for paper production.**

The paper industry is yet another area undergoing a change in thinking, with a shift towards renewable materials and energy-efficient production. There is a lot of work underway on developing alternatives to plastic packaging.

As a result, materials such as bagasse, a waste product from cane sugar production, as well as grass, coconut fibres and the quick-growing elephant grass, which also absorbs a lot of CO<sub>2</sub>, are being used in paper production.

Unusual ideas are also being developed for packaging material. For example, Heineken will use the Green Fiber Bottle for its beer in future. The 'paper bottle' is supposed to decompose within 5 years when it is thrown away. However, the brewer still wants to introduce a return system for the single-use bottle. Another example is a biodegradable, greaseproof paper lining for pizza boxes to make sure that the cardboard boxes can be recycled.

By the way, one smart cookie in the USA calculated that using the font Garamond, which takes up less space than the usual Times, could save up to 370 million dollars per year in paper costs when printing.

**PeeProject: generating power from urine.**

The carbohydrates in urine, which can be broken down by the bacteria, and its conductivity are essential for this type of power generation. When the carbohydrates are broken down, you get positive (protons) and negative particles (electrons). With the help of microbial fuel cells, power is then generated from these.

Bio energy expert Professor Ioannis Ieropoulos and his team tested their process twice at Glastonbury Festival, with 180,000 visitors the biggest music festival of its kind in Europe. A special urinal was built for the festival with 440 fuel cells. This was designed to generate the electrical voltage required to light the system. Festival goers could see for themselves how they generated power when they went to the toilet. Very few scientific experiments are quite so 'live'.

**Repair instead of replace.**

Under the name Sugru, Jane ní Dhulchaointigh\* and her team have developed the world's first mouldable glue. Jane, who hails from Ireland, had the idea to develop a product with which you can repair broken objects that you would otherwise throw away both easily and cheaply.

Sugru (Celtic for 'to play') is easy to use and incredibly versatile. The material can be shaped in such a way that it can replace missing parts. It is highly adhesive, durable and does not turn brittle. When Sugru cures, it is slightly soft (such as hard rubber) and can withstand weights of up to 2 kilograms. The adhesive makes it possible to repair things, improve them or adjust them to your personal requirements.

\* Winner of the European Inventor Award 2018.

**Sustainable packaging.**

The Nachhälter (literally 'sustainer') is a bag that was developed by Christoph Kleber and Edna Kleber-Belizário. The environmentally friendly, completely degradable cellulose bag is made from wood chips, a waste product from the wood industry. The packaging made from sustainable raw materials is compostable.

Then there's all in. WASH., a powder for a universal liquid soap, that is also joining the fight against packaging waste. As shampoo and liquid soap are up to 90% water, Boris and Oliver Schumacher came up with the idea of developing a product without water and reducing the volume to a minimum.

The powder soap gets by virtually without packaging. It is delivered by post in an envelope. To mix the liquid soap, the powder is shaken in a dispenser with water, therefore avoiding new plastic waste.





**Sustainability  
has many facets.  
Like humanity  
at TROX.**

Many of the 17 UN Sustainability Development Goals refer directly to people: to their well-being, health and education, equality and dignity. These aspects play a key role in the TROX sustainability assessment. After all, they do not just ensure the company's own ambitious approach to the values of integrity and fairness, they also connect working life at TROX with humanity.



### 'The human being is the yardstick, and people's well-being is our goal.'

With this sentence, Heinz Trox made clear what will always be the priority in his company. A guiding principle of humanity, firmly established in everyday life at TROX. When he founded the charitable Heinz Trox Foundation as the main shareholder of TROX GmbH, he also manifested this philosophy and made a statement about sustainability in practice. As a company run by a foundation, TROX can operate in a much more sustainable way than a profit-oriented enterprise and put people ahead of quarterly figures.



### Close to employees with TROX work and health management.

Social sustainability at TROX was formally introduced in 2019 with a work and health management system. Structured procedures, clearly assigned responsibilities and the ambition to deal with employees' concerns diligently all result in measures ranging from individual support right through to improvements for all.

### Health comes first.

You can only perform to the best of your ability if you are healthy. This is why TROX has launched the 'X-FIT+ Health' programme and allocates a fixed sum to it every year. This makes it considerably easier to initiate and implement measures. So far, TROX employees have been able to take part in 'active breaks', sports activities are being funded and you can get the flu jab directly from the company doctor if you wish, to name just a few examples.

Even in extreme situations such as the coronavirus pandemic with its high risk of infection, TROX acts in the interests of its employees. Employees were therefore able to work remotely from home if this was possible and reasonable. TROX has moved lots of workstations in open-plan office spaces to former meeting and project rooms to ensure social distancing. In production, workstations have been separated as much as possible. By partially amending the shift models, it has been possible to ensure that employees from different shifts do not encounter one another during their work. What's more, TROX is providing masks for situations where it is not possible to maintain the minimum distance of 1.5 metres.

In addition to this important prevention work, there has also been a fixed operational health/integration management officer at TROX since 2018, who takes care of sick employees and those who are only able to perform their duties to a limited extent. She supports the individuals to get better again and get their performance back up to their previous levels with tailored programmes.

As a result, workstations in production are continuously being ergonomically optimised, glasses required for work purposes are being subsidised and individual measures are being developed and implemented for every workstation where required.



### Well-being at TROX means feeling valued and being able to get involved.

For TROX, excellent working conditions are the basic prerequisite for enjoyable work. To guarantee these, TROX determines potential sources of stress with its employees. This makes it possible to precisely define, analyse and prevent the specific physical and mental hazards that are actually present. Together with an interdisciplinary team of employees, TROX has set up project spaces and quiet zones, known as silent rooms, for example.

Overall, a total of over 300 smaller and larger changes, which employees have established themselves in the risk assessment, have been implemented in this way.

The fact that TROX employees stay with the company for an extremely long time – 12.7 years on average – speaks for itself. As does the low labour turnover rate of 7.8% in the entire TROX GROUP. According to a study by LinkedIn, labour turnover globally is 10.9%. What's more, lots of our employees' children start their apprenticeships at TROX or work here, which is a true testament to the sense of connection with the company.

### Education creates the future – for individuals and for TROX.

TROX invests in young people and continuing education. With conviction. After all, well-trained specialists understand their trade, think outside the box, grow with their knowledge and skills, and strengthen the development of the company from within.

Every year, TROX offers an increasing number of young people a wide range of apprenticeships. In 2019, TROX GmbH took on 70 apprentices in areas including specialist IT, technical product design, industrial business management, metal technology, construction mechanics to name just a few. In general, all apprentices get a job at TROX after successfully completing their apprenticeship.

In addition to subject-related topics, the apprenticeship also looks at personal development. As part of the annual Social Day, TROX apprentices get the opportunity to get involved in society. In 2019, for example, they helped the local NABU nature conservation centre to cut free a fallen fence in a natural landscape with some highly endangered animals and plants. This nature conservation centre, which is often explored by schools and nurseries and is entirely run by volunteers, even got some TROX apprentices interested in volunteering.



TROX also supports those who want to study alongside their work – from granting leaves of absence for exams right through to covering all the costs incurred. Anyone who wants to progress will get the support they need. In addition, the TROX ACADEMY gives employees the chance to obtain knowledge and skills to make their everyday work easier. These are all great examples of how extensively TROX invests in the training and continuing education of its employees.

By boosting their specialist expertise, TROX is also making a conscious effort to encourage people in their self-confidence, their career and their willingness to get involved and make a difference.

**Digital transformation – a trend bringing opportunities to all.**

As a global player, TROX is facing the many new challenges and opportunities from the huge worldwide trend of digital transformation in a dynamic and proactive manner. Work is underway across departments to create a future-oriented digital culture. The aim is to develop a strategy that adapts to new framework conditions and to create an organisation that makes it possible to exploit the full potential of digitisation in the company.

This is all the more important as the conditions that are currently shaping the economy and our private lives have changed radically. The term VUCA summarises these factors concisely in four letters.

**What does VUCA stand for?**

<b>V</b>	Volatility
<b>U</b>	Uncertainty
<b>C</b>	Complexity
<b>A</b>	Ambiguity



The 'Enablement' initiative from the TROX Digital Transformation Steering Committee analyses how employees and managers can work as effectively as possible in a VUCA world and which skills will help them. After all, it is the people who bring a future-oriented digital culture to life. There are lots of questions to answer. What constitutes leadership in a digital world? How are all employees being included on the journey towards digital transformation? What makes TROX attractive to applicants? Employer branding, continuing education and manager development are three major topics that TROX is working on and that are becoming increasingly important.

As with digital transformation, TROX knows that there is still a lot to do here. At the same time, we can be proud that we have already taken the initial steps to prepare the company for its digital future.

**Treating one another fairly is a given at TROX.**

As an international company, TROX takes a lot of care to treat its employees fairly – regardless of their gender, nationality or religion. The company's ethical fairness and integrity guidelines ensure equal opportunities for all employees, they safeguard the dignity of all human beings and provide for the prevention of discrimination and corruption. For TROX, this is a matter of course that forms part of the Code of Conduct and therefore applies to TROX suppliers globally.

Humanity is an aspect of sustainability that plays an important role at TROX. It promotes togetherness and well-being in the company and goes beyond this with mindfulness and social commitment. In this way, Heinz Trox's guiding principle has become one of the company's strengths, which is shaping a productive, liveable future with a constant stream of new ideas.



# A carbon neutral factory in Norway.



TROX Auranor, our Norwegian subsidiary, is building a new factory. From the start, sustainability has been the guiding principle both for the building construction and for subsequent manufacturing. TROX Auranor is implementing innovative digitisation instruments (Industry 4.0) to allow for carbon neutral production right from the start.





The high-efficiency heating and refrigeration system for the building works on 100% renewable hydropower. The heat pump required that an almost 3000-metre-deep hole be cut into the rock. 50 charging stations for the electric fleet have been provided already, and another charging station for electric trucks is being set up in the shipping area.

The factory building envelope is naturally rather large, which results in high transmission heat losses. These losses have to be reduced. The solution: erecting 'a building in a building'. For example, the loading and unloading areas for raw materials and finished products have been placed inside the building, a step that reduces heat losses considerably and leads to a lower energy consumption.

**Many tools, devices and systems are used at various stages from design to production, including:**

- AURASIM – a 3D design tool that shows the air distribution within an internal space already in the design phase so that the interaction of the various components can be optimised accordingly.
- X-CUBE units – highly efficient air handling units.
- X-AIRCONTROL – a control system for demand-based ventilation and air conditioning that meets all the individual requirements of energy efficiency, comfort, air quality and acoustic performance.
- AURASAFE – allows for the flexible monitoring of fire protection and smoke control systems.
- Svalbard-I Comfort – an active chilled beam. This air-water system is used for the ventilation and air conditioning of most offices and meeting rooms. Air-water systems are always energy-efficient as they need less energy.
- SvalVent – provides demand-based comfort air conditioning in office buildings. SvalVent is the result of a joint research project on 'personal ventilation' with a research institute and TROX Auranor's biggest client KG; a patent application has been filed. SvalVent comprises basically a series of small jet nozzles that adjust themselves so that the airflow is directed at the people in a room. This ensures better air quality in particular spots as well as more pleasant temperatures while the energy consumption can still be reduced.

**CO<sub>2</sub>-neutral**

- Micon – energy monitoring for manufacturing equipment. This instrument helps to identify machinery that requires too much energy. It detects peak loads, prevents waste and thereby helps in negotiations with utility companies.

The new factory in Norway is being built with the local market in mind: short distances for the transport of incoming and outgoing products, reusable or recyclable transport packaging, and of course local employees.

Expanding the production capacity had become rather urgent, and the new facility allows TROX Auranor to produce even more environmentally friendly than before. While the old building had been certified as 'eco lighthouse', the new building is expected to get an even better certification.

So our Norwegian subsidiary demonstrates how we can be sustainable and meet both our ecological and our economical obligations.



**Norway's Prime Minister Erna Solberg visits TROX Auranor.**

Not your everyday visitor: On 30 June, Norway's Prime Minister Erna Solberg visited the TROX Auranor building site on the Mohagen industrial estate.

Managing Director Peter Sønderskov showed the Prime Minister as well as local politicians and representatives of the construction company Syljuåsen around. In addition to the construction progress the visitors could also see what an ideal production flow organisation will look like.

Information on the success story of TROX Auranor was followed by a discussion of the problems that the coronavirus had caused to the Norwegian market. The high-level visit was rounded off with a question and answer session with apprentices of TROX Auranor and Syljuåsen.



Top: Peter Sønderskov and Erna Solberg.  
Bottom: Tormod Grindstad, Peter Sønderskov and Erna Solberg.



# The RadioDuct revolution.

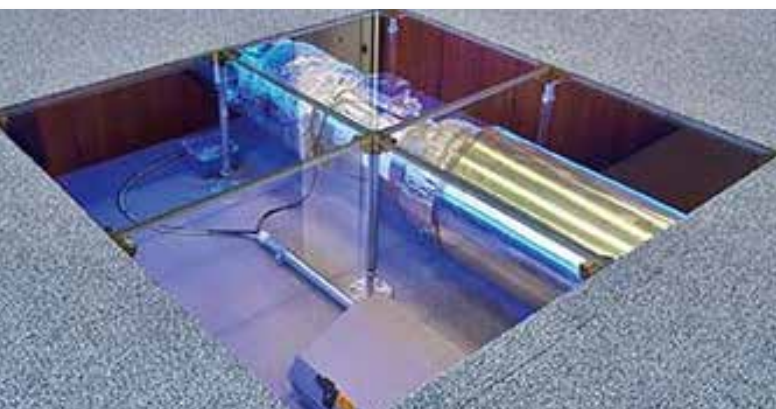


40% of the energy consumed in Germany is consumed by buildings, and a considerable number of these buildings are non-residential buildings. Demand-based ventilation systems with intelligent control systems can save large amounts of energy and consequently reduce carbon emissions.





The plant room in the TROX administration building.



Inspection windows in the floor and walls offer a glimpse into the inner workings of the RadioDuct system.



Demand-based ventilation and air conditioning controlled by radio signals.

There are currently about 600.000 ventilation and air conditioning systems in operation in Germany. Most of them are not demand-based and hence inefficient. A study by RWTH Aachen University has shown that in fact 50 to 70% of those systems do not run efficiently.

There is a huge energy savings potential waiting in old ventilation and air conditioning systems that need to be refurbished. So far, however, refurbishment has often been too complicated and expensive. In the past, refurbishing old systems meant cutting large holes into suspended ceilings so that air terminal units and other components could be replaced, and electrical cables be laid.

**Patented system based on radio signals.**

To find a solution for such cases, TROX has been cooperating with the Aachen University of Applied Sciences, RWTH Aachen University and the BFT design bureau (all in Germany) to develop suitable components that will considerably reduce investment costs. The system is called RadioDuct and works with radio signals, thereby eliminating complicated

and extensive wiring for data connections. All it needs is replacing the old volume flow controllers with new ones that can be intelligently linked; this can be done through fairly small inspection accesses. The wireless RadioDuct system uses the existing air ducts that act as waveguides. The electromagnetic waves are bundled and reflected in the hollow ducts and can in this way overcome larger distances than if signals were sent through a building and outside of the ducts.

**Field test in the TROX administration building.**

When refurbishment was due on one of the storeys of the TROX administration building, we took the opportunity to install the first RadioDuct system. The

structure and layout of the building provided ideal conditions for a pilot project that also helps to demonstrate radio-based, energy-efficient room control. Thanks to a comparison with existing data from the past, the functions and potential savings can be clearly shown.

**Convincing analysis.**

Unlike an older system without control, a system with retrofitted radio-based control is much more efficient. Optimising the ventilation fan control alone

offers a considerable savings potential for electrical energy – and then without compromising comfort and air quality. System networks are particularly useful for partial load operation, which accounts for most of the time, as they allow for exact adjustments to the actual demand at any one time. RadioDuct allows existing systems to be retrofitted with such optimised control strategies, but it can also be integrated with new systems thanks to low investment costs. Analyses carried out by research institutes show that the refurbishment of existing systems in Germany alone offers a savings potential of 255,000 t CO<sub>2</sub>-eq/a.

**Possible reduction of CO<sub>2</sub> emissions in Germany when using RadioDuct to optimise fan control.**

	Electrical energy consumed by ventilation	CO <sub>2</sub> emission
Before optimisation	21,000 TWh/a	12,726,000 t CO <sub>2</sub> -eq/a
After optimisation	20,580 TWh/a	12,471,000 t CO <sub>2</sub> -eq/a
<b>Reduction</b>	<b>420 GWh/a</b>	<b>255,000 t CO<sub>2</sub>-eq/a</b>

**Assumptions:**

- Each year, 10% of all the existing systems have to be refurbished because they don't meet hygiene or energy-efficiency requirements.
- 20% of all refurbishment projects are retrofitted with a demand-based control system.



**Conclusions.**

We can already see three positive effects:

- 1. Modernisation effect:** More intelligent ventilation and air conditioning systems work economically.
- 2. Sustainability effect:** The majority of components of an existing system remain in use. In case of a modernisation, many existing components can remain in place and continue to be used even with RadioDuct. Only some new control elements and functional components have to be installed in the ducts.

**3. Climate effect:** Modernised systems reduce CO<sub>2</sub> emissions.

The ventilation and air conditioning of buildings in Germany requires about 21 GWh of electricity per year. It has been shown that demand-based controls result in high energy savings. Modern control systems can reduce the energy consumption by 30% on average. Many buildings that so far have not been ventilated with demand-based systems can be retrofitted with the new RadioDuct system and consequently be ventilated with less damage to the environment.



# (Un)sustainability.



Has it happened to you too? Just after your device's warranty expires, it gives up the ghost. Coincidence? Certainly not! We call this planned obsolescence. Manufacturers – particularly suppliers of cheap products – deliberately plan for a product to age or wear after a certain amount of time with predetermined breaking points.



In our digital age, updates are often a predetermined breaking point. You will often find that your smartphone, for example, gets slower and slower and you are then forced to switch to a new model.

According to John Ruskin in the Common Law of Business Balance: 'There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper, and the people who consider price only are this man's lawful prey.' This always reminds me of my wise grandma:



'I can simply not afford to buy rubbish.'



Another manifestation of our throwaway society is the fact that objects are no longer repaired – instead, they are just discarded and replaced with something new. That is why there are no watchmakers anymore. Television engineers have died out. Not to mention garages that actually do repairs. They just replace everything. Thank God there are still tailors who can replace a broken zip on my jeans.



Like everyone my age in Germany, my first car was a Beetle. Dents in the bodywork were beaten out, rubbed smooth and sprayed with paint from the can. The bumper was still actually designed to absorb bumps. Little knocks didn't do any harm – you would simply hammer out dents in the stainless steel. Nowadays, the bumper is attached to the bodywork.

You would need an entirely new rear end. The cost? Approximately 1500 euros. We long for our little old Beetles.

I believe that's what unsustainability looks like today. Repairs would be better than simply throwing things away as they would protect both resources and the environment. However, garages have more and more problems getting replacement parts.

Sustainability should breathe a sigh of relief at the opportunities opening up for it.



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TROX GmbH  
Heinrich-Trox-Platz  
47504 Neukirchen-Vluyn, Germany  
Phone: +49 (0) 2845 2020  
Fax: +49 (0) 2845 202265  
trox-de@troxgroup.com  
www.troxtechnik.com

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Annulfstraße 33  
40545 Düsseldorf, Germany

Editors:  
Christine Roßkothen, TROX GmbH  
Klaus Müller, Kommunikation & Marketing

Associate editors:  
Thorsten Dittrich  
Ralf Joneleit  
Udo Jung

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Alexandra Höver

Photo editors:  
Alexandra Höver  
Klaus Müller

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TROX GmbH  
Heinrich-Trox-Platz  
47504 Neukirchen-Vluyn  
Germany  
Phone: +49 (0) 2845 2020  
Fax: +49 (0) 2845 202265  
trox-de@troxgroup.com  
www.troxtechnik.com