Issue 1 | 2024

Colubris Connects

40 years of Colubris Cleantech

1984 - 2024

Pork blood becomes drinking water

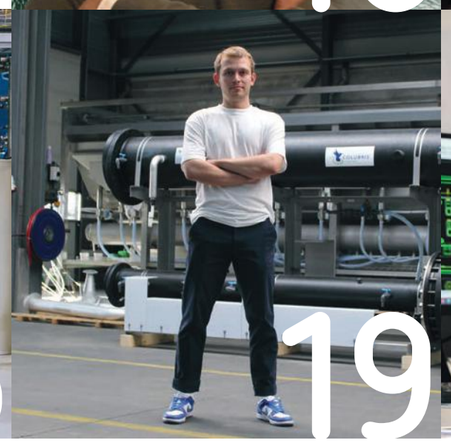
How VEOS saves 45 million liters of water annually through reuse

Growing together to an ever higher level

Plukon and Colubris continue to challenge each other

COLUBRIS cleantech

Content



Foreword

With pride, we present to you the first edition of Colubris Connects. The magazine takes you through various facets of our company. You'll gain an exclusive insight into how we tackle challenges alongside our clients and realize solutions that shape tomorrow's world.

At Colubris Cleantech, we are constantly seeking new technologies and solutions, pushing boundaries, and always aiming for the best results. We strongly believe in collaboration. We listen to our clients, understand their needs, and then work together to address them. Our focus extends beyond delivering technological solutions to also building strong and sustainable relationships.

As we look ahead and embark on new paths, we also pause to reflect on the recent loss of Gertie van den Hurk, founder of Colubris Cleantech. His vision and tireless dedication to the company have brought us to where we stand today, and his passion for innovation and sustainability remains a driving force behind our work.

Of course, we also reflect on our 40th anniversary. It's a remarkable milestone that we celebrated with many people around us.

We wish you much reading pleasure and hope you find inspiration in the stories that connect us.

Frank Tillmann | CEO

Colophon

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In Memoriam

It is with profound sorrow that we announce the passing of our beloved founder Gertie van den Hurk.

Gertie was more than just a leader; he was a connector, an inspirer, and a true people person.

In 1984, he founded what has become Colubris Cleantech, a company that thrives today thanks to his pioneering vision and unwavering commitment to sustainability. Gertie's contributions have been instrumental in shaping our business and its success.

Known for his social compassion and unique approach to life, he courageously battled ALS.

Gertie's presence and spirit will be deeply missed.

↑ Gertie and his wife Lies at the 40th anniversary celebration of Colubris Cleantech.

Pig's blood becomes potable water

VEOS saves 45 million litres of water annually through reuse

In a world where water is becoming increasingly scarce, VEOS proves that innovative technologies are not only necessary, but also feasible. The ambitious global player in animal proteins realised a water reuse project with Colubris Cleantech. Outcome, substantial savings as animal blood is now converted into 150,000 litres of additional potable water every day.

'We are in the food business and use a lot of groundwater in the cleaning in place (CIP) process where materials in production, transport equipment and storage tanks are cleaned,' says Sam Deschoemacker, Chief Operating Officer at VEOS.

'When we wanted to expand with the company, a condition in the environmental permit was that we had to find a solution to drastically reduce and control our water consumption. We chose to reuse water with Colubris Cleantech.' →

Positive pilot tests

'The idea arose to realise a new water treatment plant that provides 150,000 litres of potable water derived from blood every day. During the production process, blood is concentrated and dried. This process produces water vapour which we let condense so that it is ultimately water. We purify the water in such a way that it can be used circularly again in the production process.'

'We now use 40% less groundwater, saving 45,000,000 litres of water a year, or 18 Olympic swimming pools.'

Sam Deschoemacker | Chief Operating Officer VEOS

'Beforehand, we did extensive testing with our wastewater. This is, in fact, very specific as the concentrations of the wastes vary quite a bit. However, the results of the tests were very encouraging. We followed through on that and started the project which took about two years in total.'

'So now our wastewater goes to the improved pre-filtration. For this, we installed a completely new building. That was still a challenge because there was limited available space. The water then goes to the existing 'classic' water treatment (pre-treatment and biological, ed.). Previously, the water was then discharged into the stream. Now it goes to the new Reverse Osmosis plant (advanced filtration technology making water reusable) and is purified so we can use it again. As a result, we use 40% less groundwater. This saves us 45,000,000 litres of groundwater annually, equivalent to 18 Olympic swimming pools.'

↑ A toast to the new developments within VEOS, with 2nd from right Sam Deschoemacker

Staying ahead

'The new plant, in which we have invested EUR 2 million, is comprehensive and we are learning from our experiences every day. We have developed a user interface that visualises important parameters so that we can accurately monitor the process. This interface is linked to classical water treatment to ensure a constant flow of water to our production that complies with environmental permits. We still sometimes discuss about this with the experts at Colubris Cleantech.'

'At VEOS, we attach great importance to a circular economy and sustainability. As a family business, respect for people and the environment are central to our corporate values. We feel responsible to be a forerunner in this field and anticipate possible future challenges.'

At this time of global ecological awareness, VEOS proves that sustainability and industry can go hand in hand, with Colubris Cleantech as a crucial partner for technological water innovation. Besides being technologically successful, the implemented solution is also an example of how industrial processes can contribute to a more sustainable world.

About VEOS

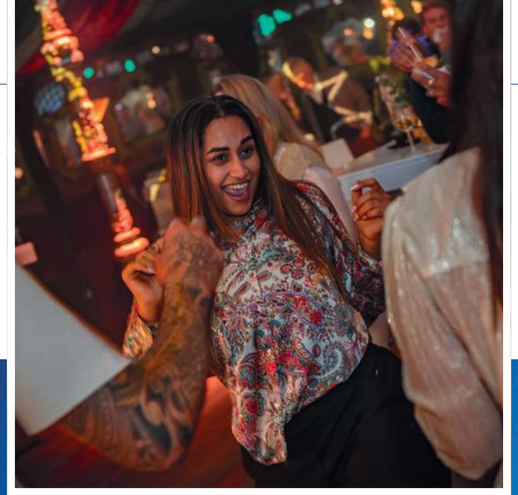
VEOS, founded in 1974, is part of the VEOS Group, a world leader in the animal protein market. The company specialises in processing by-products from the food industry, such as blood, eggs and skin. VEOS Group has production sites and a sales network around the world. It employs 350 people and is headquartered in Belgium. For more information, visit VEOS.be.

Own beer

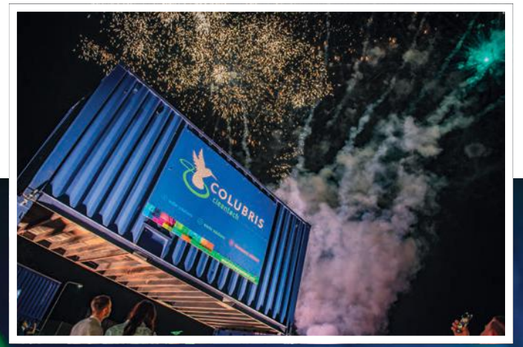
In the festive year 2024, VEOS launched VEOSKE. Specially brewed beer using water that, thanks to Colubris Cleantech's technology, is sourced from filtered pig's blood.

Relive an unforgettable milestone

40 years of Colubris Cleantech



In May, we proudly celebrated our 40th anniversary. It was a special occasion where, together with our valued customers, partners and colleagues, we reflected on four decades of cooperation, growth and success.



Scan the QR code
for the after movie.

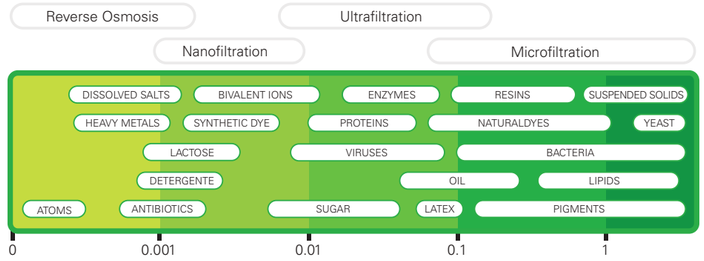
The growing impact of membrane filtration

Why Colubris applies and develops membrane technology more and more

Membrane filtration is playing an increasingly significant role in Colubris Cleantech's global projects. But what exactly is membrane filtration, and what are the new developments within this technology?

↑ The brine concentrator pilot with a multi-stage nanofiltration system up to 80 bars.

Membrane filtration is essentially a refined form of sieving, where particles can be separated down to a molecular level. The membrane, often made of plastic or ceramic, acts as a kind of sieve. There are various driving forces enabling the separation of components. The most well-known and applied driving force is pressure difference. By choosing the membrane, particles of different sizes can be separated. For instance, reverse osmosis is used in seawater desalination and water reuse. Nanofiltration is applied in the separation of multivalent ions and larger molecules. On the other hand, ultrafiltration and microfiltration are used for separating sludge or as pretreatment for reverse osmosis. →



← By choosing the membrane, particles of different sizes can be separated.

Membrane filtration has diverse applications such as water reuse, drinking water production, sludge and water separation in membrane bioreactors, stream concentration, and recovery of specific substances.

The system often comprises one or more pumps and various membrane modules. Depending on the type of filtration, the pressure across the system can range from a few tenths of a bar to 80 bars.

Increasingly Deployed in Projects

Membrane filtration is crucial in more and more projects undertaken by Colubris Cleantech. Here, we focus on recovering valuable substances and water reuse in the food industry, as well as further expanding bioresource projects. For water reuse in the food industry, we use membrane bioreactors for sludge and water separation, combining ultrafiltration with reverse osmosis. Successful examples of this include projects at HEIDEMARK (Europe's leading turkey specialist) and Badenhop (Europe's largest supplier of pet food).

Additionally, membrane filtration plays an increasingly important role in bioresource projects. For instance, at Naylor Nutritions, a white cabbage producer in England, membrane filtration is used to further concentrate the remaining liquid after protein separation into syrup. The syrup can then be used as a flavor enhancer in food products.

New Membrane Technologies

At Colubris Cleantech, we are actively involved in further developing membrane technology for broader applications. For instance, in collaboration with various water authorities, Delft University of Technology (The Netherlands), and membrane producers, we are working on directly recovering ammonium from wastewater. This ammonium can then be used as fertilizer. If successful, this project will open the door to an entirely new concept of wastewater treatment where there is no need for biological nitrogen removal.

Another development is the further concentration of brines, such as syrup streams or saline streams, using our high brine concentrator. Here, we employ a cascade of nanofiltration membranes, eliminating the need for energy-intensive evaporation techniques.

We are also exploring the further development of specific membrane technology for bioresource projects, aiming for higher-quality protein recovery. Here, we leverage the knowledge and experience gained years ago in the dairy industry regarding protein recovery from whey.

These developments underscore Colubris Cleantech's commitment to contributing to a circular global economy by harnessing our unique expertise to provide the best solutions for our clients.

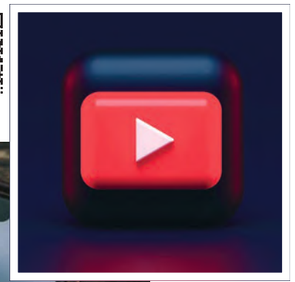
Curious about what our membrane technology can do for you? Get in touch with us at info@colubriscleantech.com or +31 (0)543 55 13 70.

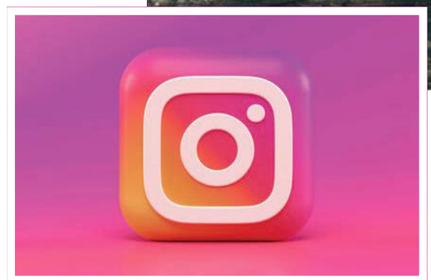
Get connected

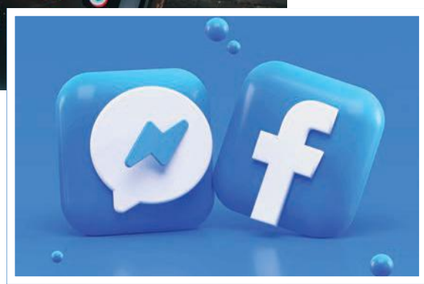
Join us on the socials

Let's connect on the following social media and keep up to date with the latest news and developments within Colubris Cleantech.

Through our social media channels, we regularly share updates, insights, and inspiring stories about our projects, innovations, and events. By following us, you become part of our growing community of like-minded professionals and enthusiasts in water, waste and bioresource technologies.



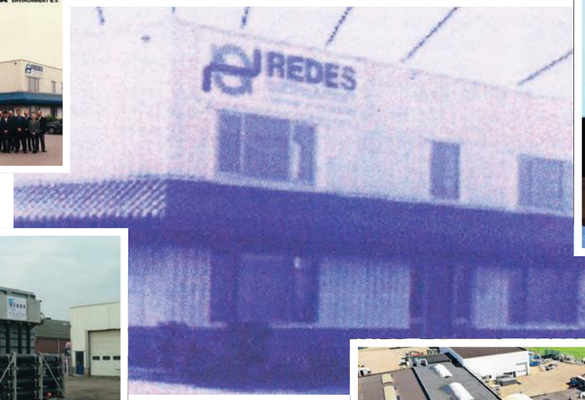




1984 - 2024

Our success story

Colubris Cleantech celebrates its 40th anniversary. Since 1984, the company has experienced tremendous growth. From a sole proprietorship, founded by Gertie van den Hurk, specialized in construction and repair work, to an organisation that operates worldwide in water, waste and bioresource projects and has representations in Hungary, Germany and Oman.



Familiar solutions, one name

Redox Water Technology, Ingenieursbureau Schneider, Redox Waste Recycling and K-Pack Water Technology are all renowned names within their fields of expertise in the recent past. What else do they have in common? Today, they all fall under Colubris Cleantech. So familiar solutions, under one name.

Watch the timeline video of Colubris Cleantech. To watch the video use the QR code or this link https://youtu.be/ZlHvGj7P54Y.

Growing greener

Hessing inaugurates Europe's most sustainable fresh produce factory

↑ Sander Mens

In 2018, Hessing embarked on the development of a completely new production location. Five years later, Europe's most sustainable vegetable factory is operational. The roof is adorned with no fewer than 12,000 solar panels, the building is devoid of gas connections, and vegetable and fruit waste is transported via a 2,000-meter-long flume system from Colubris Cleantech to the recycling center, where the rinse water is also purified for reuse.

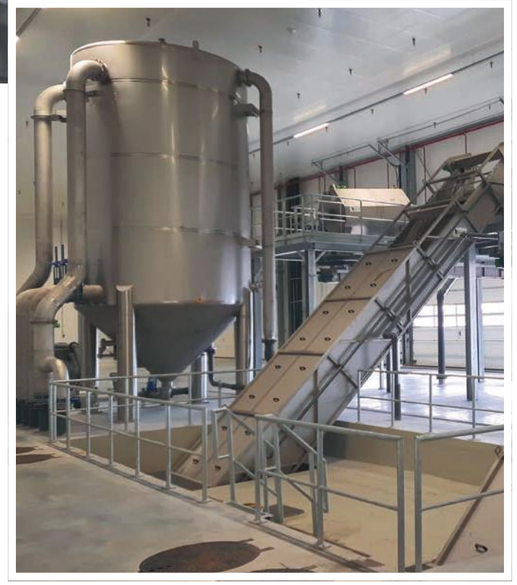
← The flume system under construction.

Since 2022, Sander Mens has been the Manager of Operations Improvement at Hessing and has been closely involved in the realization of the state-of-the-art vegetable factory. 'Within Hessing, I am responsible for continuously improving operations. We look to the future, for example, the role of further automation, and what the current needs are.'

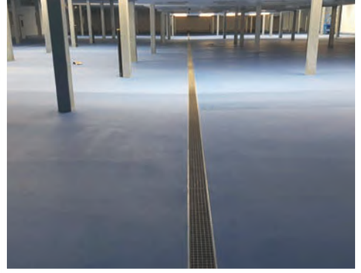
'Take the flume system that Colubris Cleantech has installed. The channels neatly transport the vegetable residues to the recycling center, where the residues are transported via containers. For a company like Hessing, waste processing is not our core business. The flume system is essentially a utility, like electricity. However, the flume system does ensure logistical efficiency and safety.'

'To brainstorm together about topics such as water conservation and reuse is very valuable.'

Sander Mens | Hessing



'Currently, we are working together with the Project Manager from Colubris to further fine-tune the system. Because as a supplier, that's where you can make a difference. If you truly assist the customer in their operations and optimization. Not just installing a system and wishing the customer success with it. A proper commissioning and guidance are essential; only then does the customer truly take ownership of the installation.' →



'A system works as well as the people have been taught to operate it. And that applies to everyone within the company who interacts with it, from users to the technical department. With the experiences gained, we continue to optimize together because it's unrealistic to expect everything to run optimally right from the start. That's why, for example, I advocate for engineers from the supplier to visit installations over time. So that they can also see firsthand what works and what can be improved for new projects.'

'In the end, Hessing also benefits from this. Because water and water usage are becoming increasingly important topics for us as well. So, brainstorming together on topics such as water conservation and reuse is very valuable. Additionally, we always like to be at the forefront of tests and pilots for innovative and sustainable solutions. Because our primary goal at Hessing remains to sustain where we can, without compromising on quality.'

How does the flume system work?

The vegetables are flushed via the 2-kilometer-long flume system at intervals to the recycling center. In this recycling center, solid waste is separated from the water using a sieve conveyor and transported to containers. These containers then go to animal feed manufacturers.

The water flows to a pump pit and is then pumped to a buffer tank, where sand/sediment is separated. The remaining water is reused in the flume system.

The system in action

A video of the implemented flume system at Hessing is available on the Colubris Cleantech YouTube channel. Scan the QR code to watch the video.

Making healthy eating easy

That's Hessing's mission. Every day, employees help facilitate healthy choices with an extensive range of pre-cut vegetables, fruit, fresh packages, and complete meal salads. Weekly, 320,000 kilograms of raw materials are processed into more than 7 million fresh products.

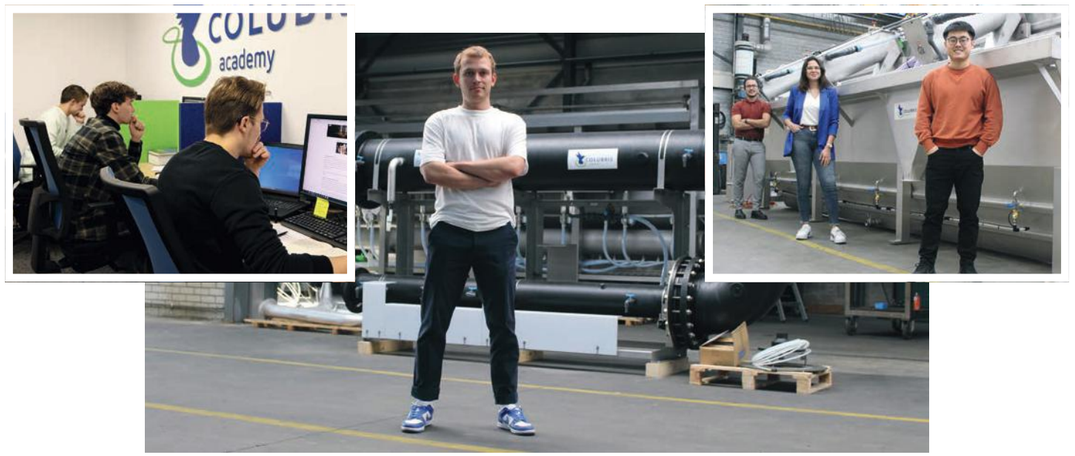
Hessing, like Colubris Cleantech, is a true family business. Since 1968, many family members have been involved in the company, which owns Europe's most sustainable vegetable cutting factory. This marks an important step towards further sustainability.

HESSING supervers

Source of Innovation Power

Discover the possibilities of Colubris Academy

Colubris Academy is a place where ambitious students, both individually and in groups, can explore and answer numerous knowledge and innovation issues in the fields of water, waste, and bioresource. In doing so, they strengthen the innovation power of Colubris Cleantech. Additionally, the Academy offers practical training and seminars for professionals in the water and waste sectors.



For students eager to tackle challenging (graduation) assignments in water, waste, and bioresource, Colubris Academy is an ideal learning environment. This collaboration helps accelerate the transition to a circular economy.

Furthermore, professionals can expand their knowledge in water, waste, and bioresources through a diverse range of practical training sessions and seminars at Colubris Academy. These sessions, led by expert and experienced trainers, take place at the Colubris Academy in Winterswijk but can also be arranged in-company if desired.

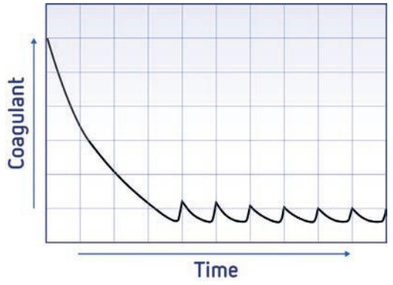
Want to learn more?

Scan the QR code,
visit colubriscleantech.com,
or contact Luan Veenhuis at.
l.veenhuis@colubriscleantech.com
or +31 0543 55 13 70.

Minimum dosing, maximum results

Improved SmartDose

Our experienced R&D colleagues and engineers are always looking for innovations and product optimizations. One of these is the recently upgraded SmartDose.



SmartDose saves money and ensures maximum performance. SmartDose matches the coagulant dosing to the removable pollution fraction in the wastewater, minimizing coagulant consumption, minimizing sludge production, the two main running costs components in wastewater treatment.

SmartDose automates and optimizes coagulant dosing in wastewater treatment. Forgoing the need for frequent manual monitoring and -dosing adjustment. SmartDose seamlessly integrates with existing plants.

How does SmartDose work?

SmartDose continuously measures the water quality between the flocs post-coagulation and flocculation. Improvement in water quality prompts a reduction in coagulant dosing while worsening prompts an increase in coagulant dosing.

SmartDose now incorporates two functions:
Eco mode, and Performance mode.

- **Eco mode** | Reduces coagulant dosage to a user-defined minimum while still removing most emulsified pollution.
- **Performance mode** | Enables SmartDose to operate autonomously, ensuring maximum removal of pollutants without coagulant overdosing.

Want to rent or test SmartDose first?

No problem. It is possible to conduct a pilot test with SmartDose or to rent it.
A business case analysis is also available.
For more information, contact the Service department at service@colubriscleantech.com or +31 (0)543 55 13 70.

'We at Ameco, are pleased with the added value of Colubris SmartDose. We observed significant savings in chemical expenditure, our operator shifted his attention away from chemical dosing monitoring to other tasks, and above all, the disposal cost savings of the reduced sludge production realized bySmartDose. All these contributed significantly to achieving the goals outlined in Ameco's CSR policy.'

William Jekel | Ameco
Maintenance Manager

Growing together to an ever higher level

Plukon and Colubris continue to challenge each other

↑ Marcel van den Heuvel, Maintenance Manager at Plukon.

What once started with the purchase of one decanter has grown into a close cooperation between Plukon and Colubris Cleantech, in which striving for the best is central. Marcel van den Heuvel, Maintenance Manager at Plukon, talks about it passionately: 'This way, we grow together to an ever higher level.'

↑ At the treatment plant of Plukon in Goor (the Netherlands), SmartDose automates and optimises the dosing of coagulant in water treatment.

'I have been working at Plukon for 28 years, where I hold the position of Maintenance Manager. As Maintenance Manager, I am responsible for all our 30 sites, spread over six countries in Europe. The technical department is therefore a large department and consists of over 500 technicians, consisting of project managers, engineers and technical specialists. We are pretty much self-sufficient.'

'We have to keep dealing with water smartly.'

Marcel van den Heuvel | Plukon

'Within Plukon, we constantly focus on improving our technical expertise. We do this, for example, by cooperating intensively with companies such as Colubris Cleantech. Our cooperation started about 10 years ago with the purchase of a decanter, but it now encompasses much more than just the purchase of equipment.
We develop, build and live together towards the realisation of new projects, always striving for the best. We have to, because purifying and reusing water is a hot topic at slaughterhouses and vegetable washing plants.
We cannot pump, purify and discharge water indefinitely. We have to keep using water smartly.'

↑ → The water treatment of the Plukon site in Nijkerk (the Netherlands), consisting of a drum filter, polymer preparation unit and a DAF unit (Dissolved Air Flotation).

'In addition, Colubris simply ensures continuity 24/7 at our sites. We have certain values we have to meet. We, but also the Colubris employees, are on top of that. We can't afford the situation where, for instance, vegetables can't be washed because the purification process isn't working. Then you need a party that is always available and ready to assist us. Moreover, we also dare to ask each other critical questions, both to become wiser, but also to challenge each other and thus grow together to an ever higher level.'

'Besides sustainability, we at Plukon pay a lot of attention to attracting and retaining motivated staff. It is crucial to keep young employees within our company and promote knowledge transfer from the experienced generation to the new. At the same time, younger employees bring with them new (digital) knowledge and technologies, which keeps our company innovating. This is also where Colubris Cleantech comes in again, as they provide the space to test new solutions and set up pilot projects. It's just great to work for companies like ours.'

'We also dare to ask and challenge each other critical questions.'

Marcel van den Heuvel | Plukon

'Sustainability is therefore one of the pillars at Plukon. When we invest in a new project, it has to be well thought through and future-proof. It is now a matter of course that we involve Colubris Cleantech. The people are experienced, easy to approach and enormously customer-oriented. And not only do I think that way, so do my colleagues.'

About Plukon

Plukon Food Group supplies poultry, meals, meal components and alternative proteins in Europe. The company employs 9,000 people across 30 sites in six European countries. In 2022, the company achieved sales of around €2.8 billion.

Plukon Food Group's mission is to provide responsible food with sustainably produced ingredients and with a focus on the long-term needs of animals, the environment and people.

Colubris electrical control cabinets meet high-quality U.S. UL 508a standard

In America and Canada, electrical switchboards and electrical components must comply with the high-performance UL 508a standard for Industrial Control Panels. This means that switchboards must be designed and built by UL 508a certified engineers and panel builders.

To best serve the North American market, several engineers at Colubris have attended and successfully completed the intensive UL 508a Standard for Industrial Control Panels training.

UL 508a design and build

So, in addition to designing in accordance with the standard, the installation must also be built as such by a UL 508a certified panel builder. Each panel is then inspected by an external UL inspector. These are very extensive inspections in which everything is checked in detail.

Meanwhile, the first panels have been designed, built and approved in accordance with the UL 508a standard.

What is Underwriters Laboratories (UL)?

Underwriters Laboratories (UL) is the largest and best-known independent testing laboratory in the world. UL has developed over 1,600 standards and operates in more than 100 countries.

Our 7 family values

Colubris Cleantech is proud to be a family business since 1984. Within and outside the organisation, we adhere to our 7 family values.

1 **Be connected** | Being connected is the basis for mutual respect. As a family business, we work on commitment and are genuinely interested without being judgmental. We are friendly and positive and help each other in good and bad times.

2 **Contribute to a positive working atmosphere** | A good working atmosphere starts with good communication and having fun. We appreciate another person's personal qualities and give each other confidence. We focus our attention on things that go well and work together to find solutions.

3 **Encourage collaboration** | We believe in the power of working together. We create an environment where cooperation is encouraged and ideas are generated.

4 **Equal treatment for everyone** | Regardless of differences: everyone is entitled to equal treatment. We oppose all forms of discrimination and preferential treatment.

5 **We above me** | We strive for a 'WE' culture where we work for the common good. There are no barriers. As a team, we work together for a better and liveable future.

6 **Teamwork** | Effective teamwork means focusing on one's strengths and trusting the common sense of the other. Daring to make mistakes, provided we learn from them, is allowed. We use each other's qualities and are task-oriented, thus achieving joint objectives.

7 **Guarantee continuity** | The primary goal is to ensure long-term continuity.

Water reuse as the goal on the horizon

How Vion Food Group continuously strives for improvement and innovation

Vion Food Group strives for continuous improvement and innovation. A recent example of this is the extensive project to relocate and upgrade the existing water treatment plant at the Groenlo site. Tom Papen, Manager of Projects & Engineering, enthusiastically talks about this challenging task where thorough planning and close collaboration with Colubris Cleantech lead to efficient and sustainable solutions, even when working under great time pressure.

↑ The present flocculator merges small suspended solids into flocs that the flotation unit can remove from the water.

↓ Tom Papen, Manager Projects & Engineering at Vion.

'As the Manager of Projects & Engineering at Vion Food Group, I am responsible for all our locations in the Benelux. This brings many technical challenges and a lot of dynamism. One moment you are working on a cooling system, and the next moment on a water treatment plant. It's precisely this variety that makes the job so enjoyable.'

'Changes in the slaughtering process at the Groenlo location (the Netherlands) required the water treatment plant to be relocated. We took the opportunity to upgrade the water treatment, including a new pump pit and replacement of valves, pumps, and pipes. Together with Colubris, we created a plan for this extensive project. The biggest challenge was the time pressure, as we had to complete the relocation in one weekend to avoid any production delays. Good preparation was essential in this.' →

'Thanks to the upgrade of the treatment system, it now works better.'

Tom Papen | Vion Food Group

'At the location, as much as possible was already prepared, such as the new electrical control system, the flocculator, and SmartDose. Ultimately, we only had to install and connect the DAF unit (Dissolved Air Flotation). We then tested the system, which naturally brought some tension. In the event of an emergency, we had trucks and big bags ready to hold the water if needed. Fortunately, we did not need them, and everything went according to plan.'

'Thanks to the upgrade of the treatment system, it now works better. For example, we now have a small buffer that responds quickly to fluctuations. The SmartDose system also works well. We have much more control over chemical usage and less sludge. This results in fewer pollution units, which contributes to our Corporate Social Responsibility (CSR) strategy and is cost-saving. In this way, we are always working on optimizing existing processes within the organization.'

← *'Thanks to SmartDose, we have much more control over chemical use and less sludge.'*

More than a supplier-customer relationship

'At Vion, we always like to look ahead, and water reuse is the goal on the horizon. We want to close the loop and are exploring the best ways to achieve this. Colubris is helping us with this.'

'Water reuse is the goal on the horizon.'

Tom Papen | Vion Food Group

'Colubris is a great company to work with. Planning can sometimes be a challenge for us. We are a meat processor, and the process must always continue, that's the most important thing. It's reassuring to have Colubris by our side. They are knowledgeable, pragmatic, and always flexible.'

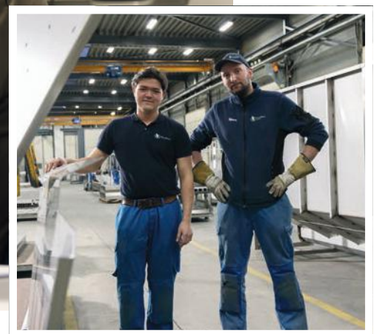
'Our relationship with Colubris goes beyond the traditional supplier-customer relationship. It is more of a partnership where Colubris genuinely wants to help us rather than just sell a system. Of course, things occasionally go wrong, but then we put our heads together and solve it. That's how you improve. They think along with us and keep us informed about developments and innovations in the treatment world. Ultimately, you achieve more together than alone.'

About Vion

Vion is an international producer of meat, meat products, and plant-based alternatives, with production locations in the Netherlands, Germany, and Belgium. The company's revenue amounts to 5.3 billion euros. Vion employs more than 11,000 people.

Will you become the newest member of the Colubris family?

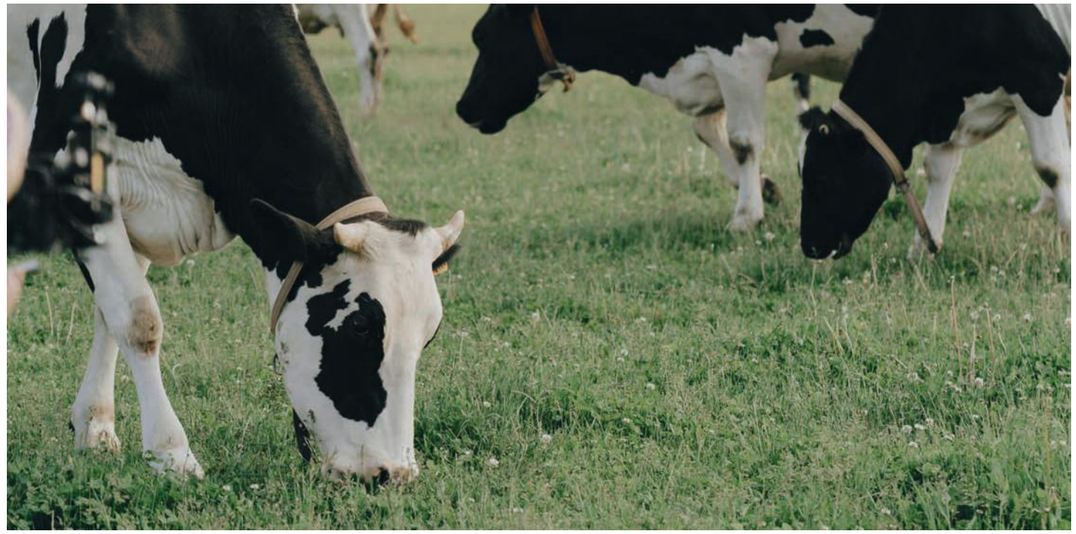
For ambitious individuals, we always have vacancies within our wonderful family business. Our mission is to accelerate the transition to a circular world economy by combining unique knowledge and offering the best solutions in the areas of water, waste, and bioresources. For this, we constantly need new socially engaged and driven colleagues.



Do you want to be active in a growing market where we develop innovative solutions for global challenges? Then quickly visit colubriscleantech.com or scan the QR code to see our current vacancies. If your vacancy is not listed, feel free to send us an open application.

Colubris' circular solutions for nitrogen issues

Nitrogen has been a much-discussed topic in the news lately. It is crucial that we manage nitrogen efficiently, and many parties, including the government, agricultural sector, and industry, play a role in this. Together, we must actively address this problem. At Colubris Cleantech, we are constantly evolving and innovating. The solutions we offer and develop play an important role in everything related to nitrogen and the transition to a sustainable future.



The role of nitrogen in nature

Plants need nitrogen to produce proteins. Animals eat these plants and use the protein from the plants to grow or produce milk. Ultimately, humans consume proteins by eating meat, dairy, and vegetables. An average person needs 56 grams of protein per day, with meat currently being the primary source of protein for most people in Western society.

Not all forms of nitrogen can be used by plants to form proteins. For example, our atmosphere consists of 80% nitrogen in the form of N_2 gas, which cannot be directly used to form proteins. There is a special group of plants that, together with certain bacteria, can convert atmospheric nitrogen into a form (such as ammonium and nitrate) that plants can use to make proteins. These are the so-called nitrogen-fixing plants.

Before the invention of artificial fertilizer in 1909, this was the only method of nitrogen fixation for protein formation. The net nitrogen fixation was very limited, making protein-rich food scarce and meat very expensive. The growth of society was essentially limited by the production of sufficient food, particularly the production of sufficient protein.

The invention of fertilizer

In 1909, German chemists Fritz Haber and Carl Bosch developed the so-called Haber-Bosch process, which uses natural gas to convert atmospheric nitrogen into ammonia. This process eliminated the need to rely on nitrogen-fixing plants to fix atmospheric nitrogen.

The Haber-Bosch process made it possible to capture large quantities of ammonia. As a result, agricultural production increased exponentially, along with the amount of available plant protein. This protein was used to feed livestock, marking the beginning of intensive agriculture.

Problems due to intensive agriculture

The extensive agricultural production and increased demand for cheap meat, however, also caused problems. Due to the food processing industry, animal manure, and human waste, the nitrogen load on nature became so great that nitrogen had to be removed from the water.

In the 1970s, water purification processes were developed that, with the help of bacteria, converted ammonium nitrogen in wastewater back into atmospheric nitrogen. This effectively prevented pollution of surface water. Colubris Cleantech has also built many of these installations, especially for industry, and continues to do so very successfully.

However, the problems were not over. Due to the ever-increasing demand for meat, even more synthetic fertilizers had to be produced. The production of synthetic fertilizers now requires so much energy that it contributes to about 2% of the total global greenhouse gas emissions. Water purification plants also require a lot of energy to remove nitrogen and have been found to produce unwanted nitrous oxide, a greenhouse gas that is 300 times stronger than carbon dioxide.

Furthermore, the increasing demand for meat puts considerable pressure on agricultural land, needed for the production of protein-rich animal feed. This leads, in addition to the use of a lot of synthetic fertilizer, to high water usage, extra greenhouse gas emissions in the form of methane, and a large demand for phosphate. Moreover, the emission of ammonia from livestock farming in the Netherlands leads to the degradation of nature reserves, causing significant societal unrest around possible solutions to this problem. →

Fundamentally, the problem must be solved by changing the way we farm, consuming less animal protein. This will reduce environmental pressure and ensure that there is enough agricultural land to provide a growing world population with sufficient food.

What solutions does Colubris Cleantech offer?

At Colubris Cleantech, we develop techniques to extract ammonium nitrogen from water for reuse as fertilizer and to extract protein from plant waste streams as a substitute for animal proteins.

By reclaiming ammonium nitrogen from wastewater and using it as fertilizer, we achieve a dual benefit. Less fertilizer is produced, resulting in reduced greenhouse gas emissions and energy consumption, and there's no need for biological purification. Currently, we're developing innovative membrane-based systems to recover ammonium nitrogen from wastewater, including that from slaughterhouses and household wastewater. This ammonium recovery technology is part of a range of technologies aimed at making the water purification process more sustainable.

We also develop and build processes to extract proteins from plant waste streams suitable for human consumption, serving as a replacement for animal protein. For instance, we're involved in a project extracting proteins through Bioresource technology from leaves generated as waste during cabbage processing. Additionally, we're engaged in a project to extract proteins from byproducts of the potato processing industry (potato fruit water) using innovative membrane technology.

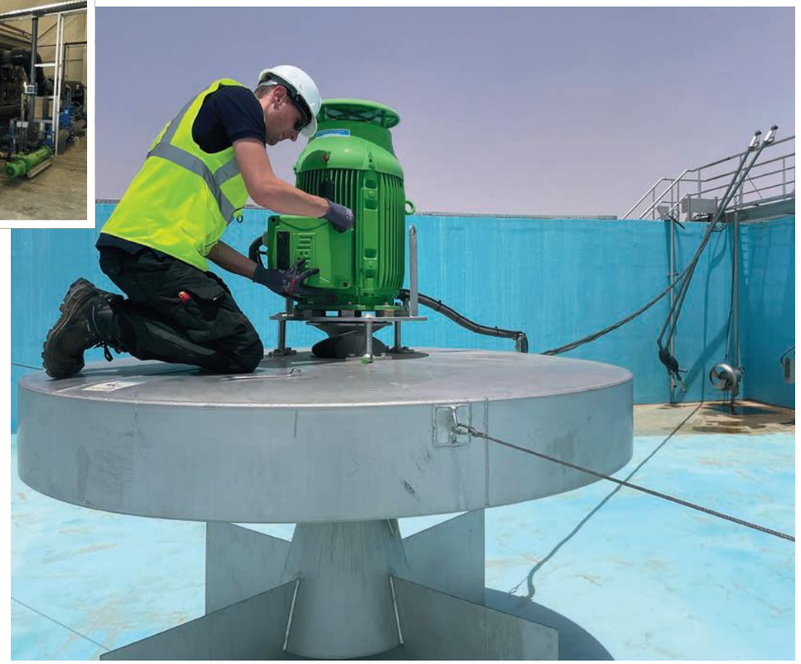
The complex nitrogen issue significantly influences Colubris Cleantech's (future) markets, processes, and projects. There will be a strong emphasis on the reuse of valuable components from wastewater (such as ammonium nitrogen, biogas, and phosphate), and Bioresource projects will become increasingly important. Many of our clients in the meat and dairy industries, for example, are already shifting towards producing and promoting plant-based protein products like meat substitutes and oat milk.

Want to learn more about the solutions Colubris Cleantech is currently developing? Get in touch with us at info@colubriscleantech.com or +31 (0)543 55 13 70.

How an internship became a unique life experience

Graduate Stan spent a month in Saudi Arabia for a project

What do you do when, during your internship, you are asked to travel to Saudi Arabia for a major project? Mechatronics student Stan Lammers didn't have to think twice, and before he knew it, he was on a plane to the Middle East. Stan enthusiastically shares about this once-in-a-lifetime experience.



→ *'I was there for the commissioning, ensuring everything works and checking that all settings and values are correct.'*

We installed a water purification system at a Saudi multinational's poultry slaughterhouse. It includes both pre- and post-treatment, allowing the water to be reused. When I visited, the entire installation was already in place. I was there for the commissioning, which means turning the knobs to see if everything works and checking if all settings and values are correct. It was incredibly interesting. The project also went well. There were no unexpected setbacks or difficulties.'

'It was also special to get to know a completely different culture. We are very punctual, but there it was much less so. However, what stayed with me the most was the friendliness and hospitality. We always received a very warm welcome.'

'It was special to get to know a completely different culture.'

Stan Lammers

Stan not only had an unforgettable trip during his internship, but he also landed a job. 'That's right, after my internship, I immediately started working at Colubris Cleantech as a Junior Commissioning and Field Service Engineer. How great is that!' New trips are already planned, this time not to Saudi Arabia, but to England and America. 'I will gain new work and travel experiences there as well. I'm looking forward to it.'

← Stan at the site of the multinational's poultry slaughterhouse in Saudi Arabia.

Looking for an Internship?

Are you in your third year or about to graduate and looking for an internship? Contact us or scan the QR code below.The internship assignments at Colubris Cleantech focus on the pillars of water, waste, and bioresources. As an internationally operating company, we see the value in combining our decades of experience with the fresh perspectives of students.

'I definitely recommend Colubris as an internship place. Everything you want to learn is possible there.'

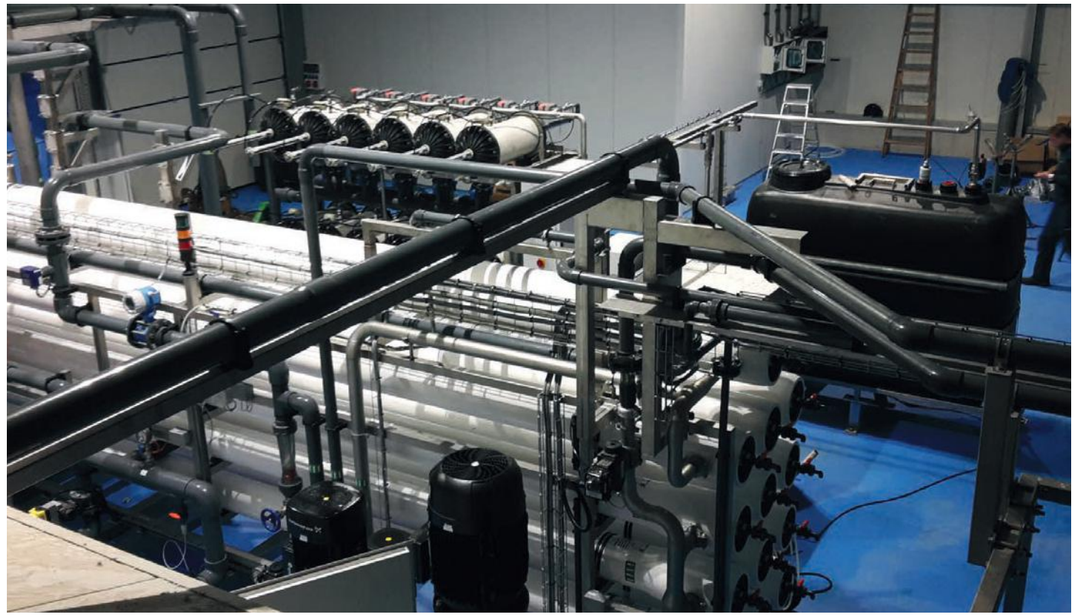
Stan Lammers

Stan: 'I would definitely recommend other students to do an internship at Colubris Cleantech. The colleagues are helpful, and the company has so many departments you can join, like Mechatronics, Marketing, Logistics, or Sales. You can do practically anything there.'

Grundfos and Colubris Cleantech collaborate on water reuse

Smart Filtration Suite

A poultry meat processing company in northern Germany required a water reuse system with a target water quality for reuse in cleaning equipment during meat processing.



Water reuse of difficult waters is a challenge, and purifying water quickly from treated wastewater became an additional problem. The reverse osmosis (RO) membranes were fouling at a rapid pace with specific CIP events, and excessive use of chemicals for inhibiting scaling led to the customer complaining about the operational costs. As a result, downtime started to be an issue since the water volume required for daily operations was not met.

Water reuse is the solution

To resolve this, the company decided on a complete Colubris Cleantech water reuse solution. The plant included biological wastewater treatment, filtration, and RO. Treating wastewater in the meat industry is per se a challenge that only experienced companies like Colubris can manage, and Grundfos proved to be the ideal partner, providing the pumps, sensors, and technical expertise that eased the configuration of the systems.

One digital solution specifically targeting membrane filtration is Smart Filtration Suite. The suite covers microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and RO. The Grundfos suite is a real-time digital solution triggering dynamic pump execution signals from a slave PLC communicating to the master PLC at the plant.

Benefits overview

Cleaner	29% reduction in energy, chemicals, time, water
Better	Higher efficiency from increased recovery, less CIP use, better CIP implementation, lower chemical consumption, and lower SEC (Specific Energy Consumption per m^3 produced)
Cheaper	EUR 20,000 total yearly savings, of which **61%** from chemical reduction **21%** from energy reduction **17%** from membrane replacement

The result: a more than satisfied customer

Since Colubris Cleantech is a close Grundfos partner, the customer was presented with the suite, and they committed for an initial test period of three months. The initial three-month test period was extended by a further three months until the decision was taken to make the solution a part of the daily operation for the coming three years. The water reuse system corresponding to the RO system (1500 m^3/d) could improve operation in terms of higher efficiency in increased recovery, less CIP use, better CIP implementation, lower chemical consumption, and lower SEC (Specific Energy Consumption per m^3 produced).

Operational costs were reduced by 29%, with an intriguing breakdown showing monetary savings for chemicals, energy, and membrane replacement by 61%, 21%, and 17%, respectively. The total yearly savings accounted for almost EUR 20,000.

The customer is more than satisfied. Thanks to the Colubris Cleantech, Grundfos-powered solution his sustainability profile has improved.

Together we ensure food safety, now and in the future

Colubris member of the Hygienic Design Network

Consumers need to be able to trust that food is produced in a hygienic and safe manner. Therefore, there are numerous standards and guidelines that the food industry must take into account. However, the implementation of these is challenging. Cohesion and knowledge are lacking. The Hygienic Design Network (HDN) was established to create clarity regarding European standards and guidelines. Colubris Cleantech has recently joined this platform.

The HDN was established because there was a need for clarity regarding European standards and guidelines in the Dutch Machinery for the Food Industry branch group.

Recognition and acknowledgment

The methodology employed by HDN is based on European standards and guidelines for designing, building, and installing machines and process installations in, among others, the food industry. HDN ensures that installations demonstrably comply with the applicable regulations.

HDN strives for recognition of the technical measures that are essential for the relevant level of safety and hygiene, and acknowledgment of the craftsmanship necessary to implement these measures.

Want to know more about the HDN platform? Visit hdn4food.com.

Where will we meet?

In 2024 and 2025, Colubris Cleantech will be present at the following events. Will we see you there?

Scan the QR code for an up-to-date overview of our event participation.

Gulfood Manufacturing

Gulfood Manufacturing is for everyone in the food and beverage industry looking to accelerate through technology by improving efficiency and productivity.

November 5 – 7, 2024
Dubai World Trade Center
Dubai
gulfoodmanufacturing.com

Aquatech

Since 1964, Aquatech Amsterdam has been the only trade show in the world that exclusively focuses on all aspects of water.

March 11 – 14, 2025
RAI Amsterdam
The Netherlands
aquatechtrade.com/amsterdam

Plastics Recycling Show Europe

The Plastics Recycling Show Europe is the leading event for plastic recycling in Europe.

April 1 – 2, 2025
RAI Amsterdam
The Netherlands
prseventeurope.com

IFFA

IFFA covers the entire market for the processing, packaging, and sale of meat and alternative proteins. It thus offers a platform for innovation and networking to the global food industry.

May 3 – 8, 2025
Messe Frankfurt
Germany
iffa.messefrankfurt.com

water solutions waste solutions bioresource solutions

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