# THE SHIFT

## Environment & Energy

**WIEN KANAL, AUSTRIA**

Learn how Europe's largest rainwater pump for flood control was installed in Vienna **on page 14**

**INTERVIEW: MASSIMO SECONDO**

The product manager's take on modern extraction technologies like ANDRITZ Turbex **on page 28**

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TECHNOLOGY. TRANSITION. TRUST. 2026/1

ANDRITZ

# THE SHIFT

ISSUE 1

# DEAR READER,

EDITORIAL

**We are delighted to introduce you to *The Shift*, the new magazine from our Environment & Energy business area.**

**Michael Lierau** Division Manager Feed & Biofuel, **Harald Reissner** Division Manager Clean Air Technologies, **Dietmar Heinisser** Member of the Executive Board Environment & Energy, **Otto Schaefer** Division Manager Pumps, **Olaf Müller** Division Manager Separation, **Sami Pelkonen** Division Manager Green Hydrogen (from left to right)

This marks an exciting step forward in how we share insights, innovations, and perspectives with our valued partners. Your trust and collaboration makes progress possible, and this magazine is designed to celebrate that partnership while keeping you informed and inspired.

The challenges we face together are profound: climate change, resource scarcity, and the transition to clean energy are reshaping industries and societies worldwide. At ANDRITZ Environment & Energy, we work at the intersection of technology and responsibility, developing solutions that help businesses adapt and thrive sustainably. These efforts form the foundation of the stories and ideas you'll discover in *The Shift*.

### WHY *THE SHIFT*?

Because transformation is at the heart of what we do. The world is moving fast, and so are we. This magazine is here to share ideas, showcase innovation, and highlight the people and projects driving meaningful change. In this inaugural issue, we explore how innovation is driving sustainable transformation across industries. From cleaner energy solutions to urban resilience and resource recovery, these stories highlight the technologies and ideas shaping a low-carbon future. Together, they show how we help businesses adapt and grow sustainably in a rapidly changing world.

Thank you for joining us on this journey. Because together, we can make the shift toward a more sustainable tomorrow.

**Warm regards,**
The ANDRITZ Environment & Energy Management Team

We transform today's environmental and energy challenges into sustainable opportunities. Our **advanced process technologies, engineering expertise, automation and digitalization solutions as well as comprehensive services** help industries **reduce emissions, conserve resources, and optimize operations.**

From clean air and water solutions to waste-to-value systems and green energy innovations, **we enable our partners to meet stringent regulations, achieve climate and sustainability goals, and secure long-term competitiveness.** Together, we shape a sustainable tomorrow.

**GLOBAL TEAM**

# 4,500 +

employees worldwide deliver deep technical knowledge and responsive support wherever customers operate.

**IMPACT ORGANIZATION**

# 5

divisions (Separation, Feed & Biofuel, Pumps, Clean Air Technologies, and Green Hydrogen) driving process technologies and innovations that help customers succeed while creating long-term value for a sustainable tomorrow.

**PROVEN TRACK RECORD**

# 170 +

years of expertise ensure that every delivered solution is backed by deep technical knowledge and proven performance.

**LOCAL SUPPORT**

# 110 +

locations across the globe provide fast, local service backed by international resources, and ensure solutions tailored to regional needs.

**MARKET LEADERSHIP**

# #1

in complete flue gas treatment proves that customers can rely on best-in-class solutions to meet stringent environmental regulations and achieve cleaner operations.

Executive Board member for the business area: **Dietmar Heinisser**

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MODERNIZING WASTE-TO-ENERGY PLANTS FOR A

# DECARBONIZED FUTURE

## Case Highlight: Zweckverband Müllverwertung Schwandorf (ZMS)



**The Zweckverband Müllverwertung Schwandorf (ZMS) association wanted to increase the availability and sustainability of its waste-to-energy plant in north-east Bavaria, Germany, and turned to ANDRITZ for its expertise in flue gas cleaning technology. By delivering the "Triphönix" project, ANDRITZ helped increase both the plant's performance and achieve a measurable improvement in its environmental factors.**

Maximizing efficiency and environmental performance are very important issues for ZMS. Comprising 17 waste disposal authorities in north-east Bavaria, the association is already doing an important environmental job by collecting and incinerating some 450,000 tonnes a year of municipal waste and transforming it into energy and district heating. However, it wanted to go a few steps further; that is why in 2024, the association embarked on a major modernization project at its Schwandorf plant. The project, named "Triphönix", aims to renew the furnace lines of the waste-to-energy plant, ensuring improved efficiency and reduced environmental impact.

Konrad Rieger, Technical Manager at ZMS, says, "We are very proud of our Schwandorf waste-to-energy plant, which has a long-standing history as an energy center and is a vital energy supplier for the whole region. Since its inception in 1982, the plant has been feeding heat into the Schwandorf district heating network, providing our neighboring industries with steam for their production processes and supplying electricity to the public grid."

### ANDRITZ – A PIVOTAL ROLE

The plant's energy generation process involves using hot flue gases from waste incineration to generate high-pressure steam, which is then used to produce electricity and heat. The three turbines of the plant operate with high efficiency through combined heat and power (CHP) and generate electricity, while the remaining low-pressure steam is used for district heating and industrial processes.

After more than 40 years of operation, ZMS decided to renew the furnace lines in its waste-to-energy plant as part of the Triphönix project, but first, the flue gas cleaning system in furnace line 4 needed to be replaced. The association selected ANDRITZ for the challenging task of retrofitting a new, state-of-the-art flue gas cleaning system due to its extensive experience in supplying decarbonization technology.

The scope of supply from ANDRITZ included the replacement of the complete reactor and filter system, the reagent storage and supply system, and product discharge systems. ANDRITZ was also responsible for the engineering, delivery, installation, and commissioning of the Circulating Dry System (CDS) TurboSorp.

"This was an interesting and challenging project," says Johannes Meyer, Technical Project Manager for ANDRITZ. "We supported ZMS from the beginning of the tender phase, sharing knowledge and applying our expertise, which was crucial in a project such as this. We immediately developed an open and trusting partnership with them, as well as with the on-site subcontractors." Rieger says, "This retrofit increases the availability of the unit, and enables ZMS to deliver reliable and affordable energy to the industry and households in the vicinity and provide safe waste disposal for local authorities. ANDRITZ has played a pivotal role in the Triphönix project, and despite the challenges posed by limited space at the existing facility, we successfully executed the project on time and within budget."

### A PARTNERSHIP FOR THE FUTURE

Clearly, the efforts of ZMS and ANDRITZ in modernizing the Schwandorf waste-to-energy plant highlight the importance of innovative solutions in achieving sustainability and decarbonization goals. "The modernization of the Schwandorf waste-to-energy plant not only ensures a secure energy supply for the future but also contributes to the region's environmental goals," says Rieger. "As the Triphönix project progresses, the plant will continue to play a key role in providing sustainable energy solutions and reducing greenhouse gas emissions."

Meyer concludes, "This partnership serves as a model for other regions and industries aiming to reduce their environmental impact and secure a sustainable future. This project proves that ANDRITZ is the perfect partner for tailored solutions, meeting both environmental and procedural requirements."

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**First step of the Triphönix project**
The renewal of the flue gas cleaning system was successfully completed, on time and on budget, in August 2024. This was the first step in the overall Triphönix project, which is scheduled for final completion in 2031.

**Meeting emission standards**
The new flue gas cleaning system complies with stringent German environmental standards and stricter EU emission limits.

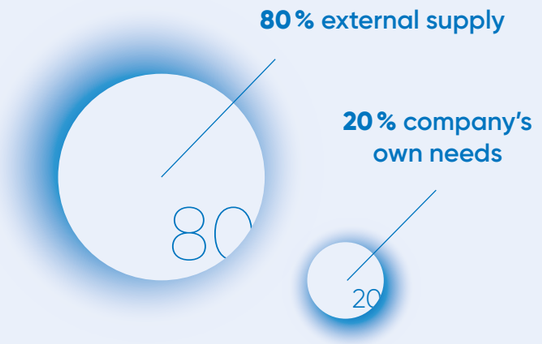
# ENERGY GENERATION IN FIGURES:

## 410 °C

The hot flue gases from waste incineration are used to generate high-pressure steam at a pressure of 72 bar and a temperature of 410 °C in the steam boilers. Of this, about 7 % is used for the ZMS's own needs and approximately 2 % for the neighboring industrial plant.

### Medium-pressure steam low-pressure steam

As the steam passes through the turbines, it expands and can be extracted as medium-pressure steam (26 bar, 350 °C) or low-pressure steam (6 bar, 160 °C).




Of the electricity generated by the generators, about 20 % is used for the company's own needs, while the remaining 80 % is supplied externally.

## 3 Turbines

The largest portion (about 91 %) drives three turbines with generators (2 × 12 MW, 1 × 32 MW) installed in the Schwandorf waste-to-energy plant and generates electricity.

## 55 %

The amount of extracted steam corresponds to about 55 % of the originally generated high-pressure steam in the plant and is used for the internal requirements of the waste-to-energy plant (about 29 %), as process steam for production purposes in the neighboring industrial plant and in the sewage sludge drying plant (about 54 %), as well as for generating 90,000 MWh of district heating for the city of Schwandorf (about 17 %).

### Substitution of 115 million liters

The energy content of the waste processed in the waste-to-energy plant in 2024 would substitute approximately 115 million liters of heating oil.

Fuel
**Municipal waste**

Capacity
**450,000 t/a**

Flue gas volume
**160,000 m³/h**

Removal of
**SOx, HCl, fly ash, Hg, heavy metals**

Hg outlet
**< 0.005 mg/m³**

SOx / HCl outlet
**< 20 / < 5 mg/m³**

Dust
**< 2 mg/m³**

## ANDRITZ TURBOSORP SYSTEM

### The ANDRITZ TurboSorp process is based on well-proven circulating fluidized bed technology.

The flue gas flows through the so-called turboreactor from the bottom to the top and then enters a downstream particulate control device, which is typically a fabric filter.

Fly ash from the incineration and fresh additives are dosed into the turboreactor, while a large part of the solid material from the reactor is fed back to the fluidized bed as recirculation. Additionally, water is injected into the fluidized bed to control the optimal process temperature/humidity, ensuring the highest possible performance.

## BENEFITS

- Proven technology with excellent references
- Removal of all pollutants in one step (dust, $SO_2$, $SO_3$, HCl, HF, dioxins, furans, PCBs, heavy metals)
- Compact design, easy retrofitting
- Low maintenance costs, simple aggregates
- Operation above dew point, no corrosion
- Low sorbent consumption due to recirculation
- High separation efficiency and low emissions (even at highest inlet values of pollutants)
- Wastewater-free

**ANDRITZ EXPERT:**

→ **Johannes Meyer**
Technical Project Manager, Clean Air Technologies

BUILDING CITIES RESILIENT
TO CLIMATE CHANGE.

# MANAGING *URBAN* *FLOOD* RISKS

**Flooding disrupts urban life**
When cities flood, the impacts cascade - halting businesses, threatening public health, displacing families, and undermining the essential systems that keep urban areas functioning.

Flooding is increasingly recognized as one of the most pressing challenges for modern cities. Today, an estimated 1.81 billion people live in areas exposed to significant flood risk, representing nearly a quarter of the world's population. Urban areas are particularly vulnerable, with population exposure projected to reach 800 million by 2050.

Climate change is accelerating this trend. This is because warmer air holds more moisture, which means heavier rainfall and more frequent extreme weather events. Each additional degree Celsius of warming increases the amount of water vapor in the atmosphere by about seven percent. This fuels storms that overwhelm drainage systems and inundate cities.

At the same time, rapid urbanization is compounding the problem. Just over half the world's population now live in cities and urban growth often replaces natural landscapes with impermeable surfaces such as concrete and asphalt. This prevents water absorption, leaving stormwater with nowhere to go except into streets, basements, and critical infrastructure.

## URBAN VULNERABILITY: WHAT HAPPENS WHEN CITIES GO UNDERWATER

The economic consequences are significant. Floods are among the costliest natural disasters worldwide. In 2022, catastrophic flooding in Pakistan caused an estimated EUR 26 billion in economic losses, reversing years of development progress. In Europe, major flood events over the past 30 years have affected 5.5 million people and resulted in economic losses of more than EUR 170 billion. Climate-related disasters overall have surged five-fold over the past 50 years, with floods among the most frequent and destructive events. For cities striving to be hubs of innovation and growth, flooding is not just an environmental challenge – it is a strategic risk to resilience and quality of life.

Urban areas are particularly vulnerable because they concentrate on people, assets, and essential infrastructure. When floodwater rises, the ripple effects extend far beyond the immediate damage. Businesses shut down, supply chains stall, and economic activity slows. Public health risks escalate as contaminated water and sewage overflow into neighborhoods. Social impacts are profound, with families displaced and communities facing long recovery periods. In short, flooding disrupts the very systems that make cities thrive.

## BUILDING RESILIENT CITIES: INTEGRATED SOLUTIONS FOR A CHANGING CLIMATE

Addressing this challenge requires more than incremental improvements. It calls for a comprehensive approach to urban resilience that combines planning, technology, and innovation. Cities must embrace integrated flood management strategies that go beyond traditional drainage systems. Green infrastructure such as permeable pavements, retention basins, and urban wetlands can help absorb excess water, while advanced engineering solutions ensure that critical systems remain operational during extreme events.

Upgrading sewer networks and installing high-capacity pumping stations is essential. These pumps serve as the last line of defense, moving massive volumes of water quickly and reliably when storms hit. Digital intelligence adds another layer of protection. Smart monitoring and predictive maintenance transform flood control from a reactive process into a proactive one, enabling operators to anticipate surges and optimize performance before disaster strikes.

At the heart of this transformation lies the power to move water reliably, efficiently, and at scale. ANDRITZ pumps are the first choice for this application, delivering exceptional flow rates and outstanding performance even under the harshest and most extreme conditions. Their proven robustness and uncompromising reliability keep critical systems running when everything depends on them, giving operators and communities the confidence to sleep soundly at night. But ANDRITZ pumps are more than machines; they are complete systems that unite high-performance rotating equipment with intelligent automation, monitoring, and predictive capabilities.

Flooding is a growing challenge, but it is one that can be managed with the right strategies and technologies. ANDRITZ is proud to support cities in building resilience and safeguarding their future. As climate change accelerates and urbanization continues, preparation and innovation will be key to ensuring that urban areas remain safe, sustainable, and livable for generations to come.

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**Integrated strategies**
Building resilient cities demands a holistic approach that blends planning, green infrastructure, and advanced engineering solutions to manage floods far beyond the limits of traditional drainage systems.

**COVER STORY:** Wien Kanal

**VIENNA'S NEW HIGH-CAPACITY PUMP STRENGTHENS RESILIENCE**

# WHEN SECONDS MATTER

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for digital article

**Vienna is raising the bar on urban flood protection. Beneath the popular beaches and bike paths of Danube Island, a massive engineering upgrade is underway: the installation of Europe's most powerful rainwater pump. Designed to handle extreme storms in seconds, this new system reflects Vienna's commitment to resilience in an era of unpredictable weather.**

**Strengthening flood defenses**
As extreme rainfall intensifies across Europe, Vienna is reinforcing its flood-protection system so the pumping station can continue safeguarding thousands of homes during increasingly severe storms.

Danube Island is one of Vienna's favorite leisure spots – a green ribbon in the Danube river with beaches, watersports, restaurants, and nature reserves. But behind the calm scenery lies another identity: a cornerstone of Vienna's flood-control system. Built to stay at least a meter above water even during major floods, the island separates the Danube from its relief channel, the New Danube. At its center sits one of Europe's largest pumping stations, ready to divert water when heavy rain threatens the city.

Extreme rainfall is no longer rare – it's becoming a regular stress test for cities across Europe. Vienna knows this well. In recent decades, storms have grown more intense, and when the Danube swells, the pumping station springs into action to protect thousands of homes in Floridsdorf and Donaustadt. This system has proven its worth time and again, but now the city is taking its defenses to the next level.

The new pump arriving on site

**The new pump is a giant**
Rising 8.4 meters high and weighing 24 tons, the pump can move an extraordinary 15,000 liters of water every second.

## A RACE AGAINST TIME AND WATER

On a normal day, Vienna moves about 600 to 2,000 liters of wastewater per second from the 21st and 22nd districts under the Danube to the Simmering treatment plant. During heavy rain, those volumes skyrocket. That's when high-capacity pumps must kick in fast to keep streets and homes from flooding.

The Danube Island station already has six pumps that together can handle 40,000 liters per second. The new pump adds another 15,000 liters per second, giving the station even more power to manage sudden surges.

## A LONG-AWAITED UPGRADE

When the new pump is fully commissioned, it will mark the culmination of nearly 60 years of planning. The pumping station was built as part of the "Improved Flood Control on the Danube in Vienna" Project, launched in 1969. That project didn't just create the station – it reshaped the river itself. The New Danube was excavated as a flood relief channel, and the material was used to form Danube Island.

Even then, planners anticipated that rainfall would become more extreme. They left space inside the station for future upgrades. That time has now come.

## TIME FOR ACTION

The new pump is a giant: 8.4 meters tall, weighing 24 tons, and capable of moving 15,000 liters of water every second. To put that in perspective, it could empty an Olympic swimming pool in under three minutes – or a backyard pool in just about three seconds. This makes it Europe's most powerful rainwater pump of its kind.

It was designed, manufactured, and installed by ANDRITZ, drawing on more than 170 years of expertise in pump engineering. The choice of ANDRITZ was driven by the project's extreme requirements: high demands on start/stop operation under the most adverse conditions meant that a standard solution simply wouldn't suffice. Instead, a technically optimized pump tailored to the customer's needs was essential to guarantee reliability when it matters most.

Tine Kocbek, ANDRITZ Project Manager, says: "Commissioning a pump of this capacity isn't about spectacle, it's about precision. Every component is engineered so that, when the system calls for peak performance, the pump delivers – first time, every time."

Work on the upgrade began in 2024, following a commitment by Vienna's sewage department, Wien Kanal, to strengthen flood defenses. The project doesn't stop at adding a seventh pump – it's a full modernization. Hydraulic gates, pressure valves, ducting, frequency converters, and software integrations are all being updated. The building itself is getting new insulation, an external sunshade, and a green roof that will later host solar panels.

**Engineered for extremes**
ANDRITZ developed a custom, technically optimized pump system designed to withstand extreme start-stop demands and deliver absolute reliability where standard solutions fall short.


PRECISION

**Engineered for longevity**
To withstand the immense strain of pumping 15,000 liters of water per second, ANDRITZ engineered every component for a 50-year service life under abrasive, high-speed emergency conditions, using wear-resistant stainless steel, advanced coatings, and optimized bearings.

## NO ROOM FOR ERROR

Fitting a pump this size into an existing facility is no small feat. The station had to remain operational throughout the process, ready to respond to any storm. Engineers faced a tight squeeze – just three centimeters of clearance through the main entrance. Every step, from transport packaging to lifting and positioning, required millimeter-level precision.

As Tine Kocbek explained: "Installing in an operating plant demands precise planning and a perfectly coordinated process. Millimeter accuracy is essential to ensure the pump is leak-tight and functions smoothly."

## WHY NOW – AND WHY IT MATTERS

Some might wonder why invest in equipment that will only run for short periods each year. But climate variability is changing the odds. Extreme rainfall events are becoming more frequent and more intense, and urban networks need redundancy and surge capacity to avoid cascading failures. Vienna's strategy has always been forward-looking: anticipate risks, maintain systems, and upgrade before disaster strikes.

For residents of Floridsdorf and Donaustadt, the benefits are clear: shorter flooding periods, reduced overflow risk, and faster recovery when storms hit. For operators, the system gains precision and buffer capacity, ready to respond automatically when sensors detect rising flows. Within minutes of a cold start, the impeller can ramp up to 300 revolutions per minute.

With up to 15,000 liters of water being sucked through the pump every second, the strain on the impeller can be enormous. To ensure reliability well into the second half of the 21st century, ANDRITZ engineers designed every component – from the impeller and housing to the shaft seal – for a service life of 50 years, even under emergency conditions with abrasive, high-speed flows. This includes wear-resistant stainless steels, multi-layer coating systems on exposed surfaces, and optimized bearing arrangements to minimize mechanical losses.

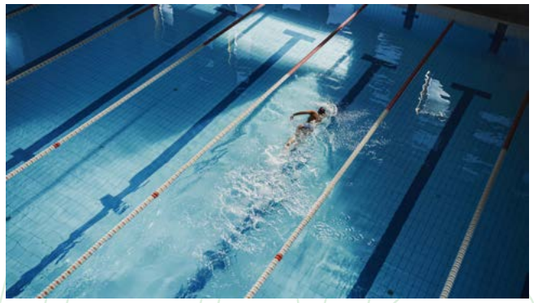
How much use will it see in that time? Based on the likely frequency of heavy rainfall in the region, the new pump is only expected to operate for about 50 hours per year. That may sound like an overkill, but in those rare hours, it protects thousands of homes and lives – proof that resilience is built for the moments that matter most.

*Commissioning a pump of this capacity isn't about spectacle – it's about repeatable accuracy. Every tolerance, every interface, every control loop is engineered so that, when the system calls for peak performance, the pump delivers – first time, every time.*

**Tine Kocbek**
Senior Project Manager

# 15,000 l/sec

The pump is capable of moving 15,000 liters of water every second. To put that in perspective, it could empty an Olympic swimming pool in **under three minutes** – or a backyard pool in just **about three seconds.**



RESILIENCE


Design
**ANDRITZ Vertical Line Shaft Pump**

Impeller
**1.72 m**

Head
**11.1 m**

Flow rate
**15,000 l/sec**

ANDRITZ VERTICAL LINE SHAFT PUMP

**Hydraulic design**
This new vertical line shaft pump has a specially developed impeller and housing that are designed for extreme pressure surge conditions. The optimized blade geometry reduces turbulence and the risk of cavitation. Reinforced flow channels ensure stable operation even at 15,000 l/s. Improvements in hydraulic efficiency reduce energy consumption during peak loads.

**Highly efficient drive and motor system**
To accelerate from standstill to 300 rpm in a matter of minutes, the pump uses a high-torque, vibration-optimized drive system:

- Project-developed motor with reinforced rotor dynamics
- Frequency converter with low harmonics for smooth start-up
- Intelligent start-up logic prevents hydraulic shock loads in the station network

BENEFITS

## Advanced pumping technology for Wien Kanal.

- Customized to specific needs and requirements
- Hydraulic impeller blade adjustment
- Speed control unit for the drive
- Separately mounted, angle-adjustable impeller blades to optimize efficiency or alter the duty point at a later stage
- IIoT ready

**ANDRITZ EXPERT:**

→ **Tine Kocbek**
Senior Project Manager

## DESALINATION IN THE AGE OF WATER SCARCITY

# TURNING THE TIDE

**By 2030, global demand for fresh water is projected to outstrip supply by 40 % - a staggering figure that underscores one of the most pressing challenges of our time: water scarcity. As climate change accelerates, populations grow, and industrial and agricultural needs intensify, the availability of clean water is becoming increasingly strained. This megatrend is not confined to arid regions; it is a global phenomenon reshaping how societies think about water access, infrastructure, and sustainability.**

Today, over two billion people lack access to safe drinking water, and nearly half the global population experiences water shortages for at least one month a year. These figures, drawn from the UN World Water Development Report and other leading studies, underscore a sobering reality: water scarcity is no longer a distant threat – it is a defining challenge of our time.

### THE DRIVERS BEHIND THE CRISIS

Water scarcity is driven by a complex interplay of factors. Climate change is changing rainfall distribution and intensity and accelerating droughts. Because while the total volume of global precipitation hasn't yet changed dramatically, where, when, and how intensely it falls has shifted significantly. Furthermore, rapid urbanization and population growth are increasing demand, while aging infrastructure and poor water governance exacerbate the problem.

In many regions, groundwater is being depleted faster than it can be replenished. Meanwhile, pollution from industry, agriculture, and domestic sources continues to degrade the quality of available freshwater. The result is a growing "water gap": a mismatch between supply and demand that threatens food security, economic development, and social stability.

*Water scarcity is a present reality. The challenge is no longer if desalination works, but how to scale it responsibly.*

**Jorge Muñagorri**
Industry Director Water, Pumps, ANDRITZ

### DESALINATION: PROMISE AND PROGRESS

While freshwater makes up only 2.5 % of the Earth's water – and less than 1 % is readily accessible for human use – nearly 80 % of the world's population lives near coastlines. This proximity to seawater presents a compelling opportunity: Desalination.

This process, which removes salt and impurities from sea or brackish water, has become a necessity to provide fresh water to many coastal cities and water stressed regions. Since oceans cover over 70 % of the Earth's surface, desalination offers access to an almost limitless water source. Countries like Saudi Arabia and Australia have already integrated desalination into their national water strategies. Notably, cities outside traditional desalination hubs are now joining the trend: Hong Kong's first municipal reverse osmosis (RO) plant at Tseung Kwan O came online in December 2023 with a capacity of 135,000 $m^3$ / day, adding a climate-resilient water supply to a dense urban system.

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**Coasts create opportunity**
Although less than 1 % of the planet's water is easily accessible freshwater, the fact that nearly 80 % of the world's population lives near coastlines makes seawater desalination an increasingly compelling solution.

**High-performance pumping**
Designed for every stage of seawater desalination, ANDRITZ centrifugal pumps – crafted from duplex and super duplex stainless steels – deliver exceptional efficiency, corrosion resistance, and minimal maintenance across reverse osmosis and treatment processes.

## INNOVATIONS CUT COSTS AND ENVIRONMENTAL IMPACT

Historically, desalination has been energy-intensive and costly while the environmental footprint of desalination – particularly brine disposal and marine ecosystem disruption – has been a concern. However, recent innovations in brine treatment and salt recovery are helping mitigate these effects and are changing the landscape as they reduce environmental impact and lower operational costs. Solar-powered desalination plants, zero-liquid discharge systems, and circular water reuse models are emerging as promising pathways. The World Economic Forum and other global institutions now recognize desalination as a key technology in climate adaptation and water security strategies.

## THE FRESHWATER FUTURE STARTS WITH ANDRITZ

At ANDRITZ, we provide efficient and reliable technologies which are key components of desalination plants.

*ANDRITZ provides advanced technologies for efficient, reliable, and sustainable freshwater production.*

**Loïc Lebègue**
Industry Director Environment, Separation, ANDRITZ

Our centrifugal pumps are designed for seawater desalination applications, particularly for Reverse Osmosis (RO) plants. We offer main pumps for the seawater intake, pre-treatment and high-pressure stages, as well as the secondary pumps for water transport, and backwashing. Our pumps, made from duplex and super duplex stainless steel, resist corrosion and erosion - ensuring the highest efficiency on the market and minimizing maintenance. In addition, water intake is a key process step where water taken out of the environment must be first filtered before it is processed. Our range of screens, for both onshore and offshore applications, is designed to minimize headloss, deliver a high debris capture rate, and ensure the protection of aquatic life, particularly in compliance with fish protection regulations.

Finally, at the back end of the process, the sludge, residue of the water treatment, must be managed. Our dewatering technologies are specially designed to handle this highly corrosive and abrasive slurry. With this portfolio of proven technologies, we, at ANDRITZ, are supporting the industry in making desalination a performing and cost-efficient process to produce fresh water. We proudly contribute turning seawater into a secure resource for communities and industries worldwide.

## FLOWING FROM SCARCITY TO STEWARDSHIP

Water scarcity is not a distant threat – it is a present reality. Desalination offers a powerful response, but its success depends on continued innovation, cross-sector collaboration, and a commitment to equitable access. As we navigate this megatrend, the question is not whether we can desalinate more water, but if we can do so responsibly, sustainably, and inclusively.

In the face of rising demand and dwindling supply, turning seawater into fresh water is a necessary evolution. And with science, policy, and industry aligned, we have the tools to turn the tide.

**Safeguarding every step**
From minimizing headloss and safeguarding aquatic life with high-efficiency intake screens to reliably handling corrosive, abrasive sludge with advanced dewatering technologies, ANDRITZ supports both, the front and back end of the water-treatment process.

**ANDRITZ EXPERTS:**

- → **Jorge Muñagorri**
  Industry Director Water, Pumps
- → **Loïc Lebègue**
  Industry Director Environment, Separation

# FIGHTING WATER SCARCITY
## ONE PROJECT AT A TIME

### Cap Blanc, Algeria

In Oran, Algeria, access to clean water has long been a challenge. The Cap Blanc seawater desalination project – with a daily capacity of 300,000 $m^3$/day – is set to change that, supplying over 2 million people in the region and becoming one of the largest facilities of its kind in North Africa. The project strengthens water security in a water-scarce region and supports sustainable urban and industrial development for the future.

**ANDRITZ will support Algeria's largest seawater desalination project with 77 centrifugal pumps (and motors, some up to 3 MW).**

### Tseung Kwan O, Hong Kong

The Tseung Kwan O desalination plant in Hong Kong supplies fresh drinking water to around 850,000 people, covering about 5 % of the city's total demand. ANDRITZ delivered a complete solution for this project, including 61 high-performance pumps and two filter presses for efficient brine slurry dewatering. These technologies support reliable water production of 135,000 $m^3$/day and significantly reduce waste volumes, supporting sustainability goals.

**This flagship project sets a benchmark for sustainability and resilience in water supply in this region.**

### Quebrada Blanca, Chile

The Quebrada Blanca Phase 2 project in Chile's Atacama Desert includes a desalination plant and a 165-kilometer pipeline to supply water for copper production at 4,300 meters altitude. ANDRITZ supplied 11 high-efficiency process pumps and two decanter centrifuges made from corrosion-resistant duplex stainless steel to manage seawater intake and brine dewatering.

**ANDRITZ technology ensures reliable water supply under extreme conditions and supports sustainable mining operations.**

### Muscat, Oman

Oman's largest potable water desalination plant was designed to maximize efficiency and minimize environmental impact by reducing brine waste. ANDRITZ supplied two high-throughput decanter centrifuges for brine dewatering, achieving optimal sludge dryness for safe and cost-effective disposal. This solution ensures continuous, reliable operation while lowering transportation costs and improving centrate recovery.

**With this contribution, ANDRITZ supports Oman's efforts to secure long-term water availability and meet growing demand in a sustainable way.**

# INDUSTRIAL FOUNDATION. GREEN FUTURE

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**ANDRITZ's Electrolyzer Gigafactory in Erfurt bridges over a century of industrial craftsmanship and a new green hydrogen future. History and the future sit side by side on an industrial site in Erfurt, capital city of the German Free State of Thuringia.**

For more than 125 years, the site has been a hive of industrial manufacturing. For many years now, it's been home to an ANDRITZ Schuler factory producing heavy duty hydraulic and mechanical presses, the kind capable of – among many other industrial applications – forming sheet metal into car parts. And in June 2025, the site entered a new era – one benefitting Thuringia's other name: the Green Heart of Germany.

The energetic new arrival to the site is ANDRITZ's first Electrolyzer Gigafactory, dedicated to assembling electrolyzer stacks and phase separators: the core components for producing hydrogen.

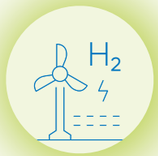
Hydrogen is in demand as a clean fuel, and as an ingredient in a range of manufacturing processes. Green hydrogen is poised to significantly reduce carbon emissions in hard-to-abate industries: steel and fertilizer production, sea and air transportation, and more.

But for green hydrogen to fullfill its promise, it has to be produced and deployed on a large scale. And achieving that scale requires a bold, efficient and modern approach.

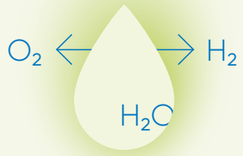
## ADVANCED TECHNOLOGY WITH THE HUMAN TOUCH

This Electrolyzer Gigafactory is a people-powered operation. The assembly line is fully manual, involving the assembly of electrolyzer cells and the construction of phase separators, and combining them into stacks and complete plants. A skilled workforce continuously works on optimizing the process to improve efficiency and ensure consistent quality.

**SHAPING THE SHIFT:** Electrolyzer Gigafactory




# THE SCIENCE OF GREEN HYDROGEN




**GREEN HYDROGEN**
is hydrogen produced by electrolysis driven by renewable energy.

**ELECTROLYSIS**
means using an electrical current to start a chemical reaction.

**A WATER ELECTROLYZER**
uses an electrical current to split water into oxygen and hydrogen.

In traditional hydrogen production, methane is chemically split into hydrogen, carbon monoxide – and carbon dioxide ($CO_2$), a greenhouse gas that contributes significantly to climate change. Hydrogen produced from methane has become known as **gray hydrogen,** or **blue hydrogen** if the producer takes measures to prevent the $CO_2$ escaping into the atmosphere.

Hydrogen from electrolysis is called green because electrolysis doesn't produce $CO_2$ – only hydrogen and oxygen. If electrolysis is powered by renewable electricity, the resulting hydrogen is considered green. While some $CO_2$ emissions may still occur during renewable power generation, they are significantly lower than conventional methods.

**Global Blueprint**
The Erfurt electrolyzer gigafactory sets the standard for future sites worldwide. Its concept is designed for easy transfer to locations near major upcoming projects.

The electrolyzer technology itself comes from ANDRITZ' partner HydrogenPro. Combining HydrogenPro's advanced technology with ANDRITZ' manufacturing excellence guarantees the highest quality end product from day one of Gigafactory operations.

"We were confident in our products' performance from day one because, in the months before the Gigafactory's inauguration, we carried out 500 hours of performance validation at the HydrogenPro test site in Norway.

The electrolyzer stack technology assembled at the Gigafactory has been proven to perform as expected, and to be safe. And we check and confirm that quality every day, making sure our products meet European standards."

"Like the assembly itself, the quality control processes – which include pressure-testing and CE-certifying the electrolyzers and phase separators – are also carried out by humans," says Martin Draxler, Project Manager, Green Hydrogen at ANDRITZ.

Besides, the Electrolyzer Gigafactory is designed for flexibility, allowing production to be easily upscaled to meet increasing demand. Erfurt was the ideal place to launch this kind of factory. The city has an industrial heritage dating back to 1850, when factories sprung up to produce everything from engines to electro-technics. Its central European location, served by roads built and reinforced to cope with heavy freight, makes it easy to transport all sorts of products to customers' sites. It's a city used to building things, which is now applying its industrial strength to innovative green technology.


→ **Joachim Schönbeck,** CEO of ANDRITZ, and **Mario Voigt,** Prime Minister of Thuringia, officially inaugurated the Electrolyzer Gigafactory. They were joined by management colleagues from ANDRITZ Environment & Energy and ANDRITZ Schuler.



**At our site in Erfurt, we benefit from the existing infrastructure and look back on over 125 years of expertise in heavy machinery construction.**

As Joachim Schönbeck, CEO of ANDRITZ, put it: "At our site in Erfurt, we benefit from the existing infrastructure and look back on over 125 years of expertise in heavy machinery construction."

### SCALING TO SERVE THE GREEN REVOLUTION

Launching in Erfurt also gave ANDRITZ the benefit of Germany's rigorous dual apprenticeship system. Because local recruits have all completed apprenticeships, they don't need to learn as much on the job. If demand increases sharply and the factory needs to scale up fast, there's a pool of well trained people already waiting, who can start doing a great job from day one. The Prime Minister of Thuringia, Mario Voigt, put it succinctly at the inauguration: "As the Green Heart of Germany, our Free State offers the best conditions for industrial innovation."

The Electrolyzer Gigafactory's first customer is the German steel manufacturer Salzgitter. Steel manufacturing has historically given rise to significant carbon emissions. Salzgitter's new 100-megawatt (MW) electrolysis plant is set to correct that course. And many others in the European steel industry – and beyond – are sure to follow suit. Green hydrogen is a key ingredient in a new green industrial revolution. It's necessary for manufacturing electro-fuels, or e-fuels, like e-methanol, which could play a significant role in decarbonizing international shipping. Similarly, green hydrogen can be combined with nitrogen to produce e-ammonia, a potential solution for the traditionally emissions-intensive fertilizer business.

As a full engineering, procurement, and construction (EPC) company, ANDRITZ can do more for its electrolyzer customers than supply the technology. It can deliver a green hydrogen plant project, from design engineering to operation and maintenance, informed by the deep understanding of the core technology that can only come from assembling it in-house.


Martin Draxler resumes, "We're constantly learning and refining both our assembly processes and the quality of our end product, thanks to our skilled people, smart material handling, and focus on innovation. And not only is this people-powered model scalable at the Erfurt factory, it's also replicable at other sites." ANDRITZ can now quickly and easily deploy this proven model – anywhere we operate; wherever demand for green hydrogen arises.

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**ANDRITZ EXPERT:**

→ **Martin Draxler**
Project Manager, Green Hydrogen

# WE CAN HELP

## Enabling the circular economy and increasing profitability in the food and beverage industry by unlocking value from side streams.

**Modern extraction technologies are redefining what the food and beverage industry considers a valuable resource. Instead of limiting production to traditionally edible raw materials, advanced processes now make it possible to recover high-value components from plant fractions that were once treated as waste or low-grade by-products.**

**Massimo Secondo**
Product Manager Turbex at ANDRITZ Separation, explains how Turbex helps industrialize value from side streams and supports profitable circular business models.

This shift is not only an environmental imperative but also a decisive lever for economic resilience, margin optimization, and long-term competitiveness. Massimo Secondo, Product Manager for Turbex at ANDRITZ was interviewed, about how the company partners with customers to industrialize value, reduce risk, and turn circularity into measurable business results.

**How can modern extraction technologies help the food and beverage industry save energy and create value from side streams?**
Modern extraction technologies are at the heart of a circular economy approach. They enable the transformation of what was once considered waste – such as leaves, stems, husks, and other residual plant matter – into valuable ingredients for food, nutraceuticals, and functional applications. Every kilogram of by-product reused is a kilogram that does not generate additional emissions through disposal or require new raw material sourcing. This directly reduces the carbon footprint while maximizing yield per hectare and per ton of input - a strategic necessity as raw material costs rise and agricultural land becomes increasingly scarce.

By unlocking the nutritional, functional, and commercial potential of these side streams, we help our partners create new revenue streams and strengthen their economic resilience.

**What does this shift toward full valorization of biomass mean for the industry's future?**
It means that the complete utilization of plant and biomass will become standard practice. The food industry can no longer afford linear production models that waste usable raw materials. Technologies that enable full valorization will determine who leads the market – transforming by-products into revenue streams, reducing



CIRCULAR ECONOMY | REDUCTION OF FOOD WASTE | FOOD BY-PRODUCT VALORIZATION

## MASSIMO SECONDO
Product Manager
Turbex, Separation

With three decades of experience in mechanical and thermal dewatering, Massimo Secondo brings a unique blend of technical expertise and strategic vision to ANDRITZ. Holding a master's degree in management engineering from Politecnico di Milano and an MBA from SDA Bocconi, his career began in 1995 at Krauss Maffei in Germany as a Sales Engineer and Project Manager, later advancing to Managing Director of the Italian legal entity in Milan.

Since joining ANDRITZ in 2010 following the KMPT acquisition, he has focused on building trustful customer relationships and driving innovation for sustainable solutions - where technologies like Turbex play a key role in solid/liquid extraction. Based in Milan, he balances his professional passion with family life and hobbies such as skiing and freediving.

### PROFESSIONAL FOCUS
Massimo leads innovation in plant-based extraction technologies, with a strong emphasis on sustainability, efficiency, and unlocking new nutritional potentials from previously unused raw materials.

### PURPOSE IN ACTION
Through technologies like the Turbex extractor, Massimo and his colleagues enable the food and beverage industry to recover valuable ingredients from by-products such as citrus peels or olive leaves. By turning what was once considered waste into valuable nutritional ingredients, their work drives sustainable growth.

### WHY IT MATTERS
Driven by the belief that "no part of nature should go to waste", Massimo advocates for a future where all biomass is fully utilized. His work supports global food security and the transition to more resource-efficient nutrition systems.

### VISION FOR THE FUTURE
Massimo envisions a world where functional nutrients are not just a trend but a foundation for healthier living. His vision aligns with the growing demand for sustainable, body-positive food innovations that empower consumers to age well and live better.

**The trend toward a healthier and more sustainable lifestyle is accelerating. Consumers are increasingly willing to invest in functional foods and beverages that support wellbeing and align with values like animal welfare and environmental responsibility.**

**Turbex mobile unit**
A skid-mounted rental unit enables process validation tests and timely extraction operations. Equipped with inlet and outlet pumps, it efficiently handles pre-soaked materials during temporary or pilot-scale applications.

dependency on primary resources, and turning circularity into measurable business value. This is not just about sustainability, it is about profitability and long-term competitiveness.

**How does ANDRITZ support customers in identifying and monetizing valuable components from side streams?**
Our role goes far beyond supplying extraction equipment. ANDRITZ acts as a strategic partner throughout the entire value creation journey. At an early stage, we work closely with customers to evaluate their raw materials and side streams, conducting feasibility studies and analytical trials to identify which components can be extracted, at what quality, and with what economic potential.

At our Food Innovation Xperience Center (FIX) in the Netherlands, customers can validate processes under realistic conditions, optimize extraction parameters, and generate robust data to support confident investment decisions.

ANDRITZ Food Innovation Xperience Center (FIX)

**Food Innovation Xperience center (FIX), a strategic asset for investment security**
At our FIX center at ANDRITZ Gouda B.V. in the Netherlands, customers reduce technical and financial risks by validating processes under realistic conditions and generating robust data that form a solid foundation for strategic investment decisions. Through advanced trials, analytical measurements, and expert guidance, we ensure optimal solutions and secure scale-up from concept to industrial production.

This structured, end-to-end approach ensures faster time-to-market, predictable performance, and maximum value recovery.

**Can you share examples of promising side streams and how ANDRITZ helps industrialize their value?**
We see strong demand for improved utilization of materials such as citrus peel, which can yield fruit oils and flavors, or spent grain from breweries, which contains valuable polyphenols like p-coumaric acid and ferulic acid.

Our Turbex extractor enables the extraction of a wide variety of plant substances – from leaves, flowers, roots, or bark – provided the material is properly prepared. We have implemented projects in Japan, Italy, and Turkey, extracting high-value compounds such as oleuropein from olive leaves and tannins from oak bark or chestnut shells.

By supporting customers from pilot testing (including on-site campaigns with our mobile units) through to full industrialization, we help them transform side streams into scalable, profitable business models.

**Scaling up from laboratory trials to industrial production is a major challenge. How does ANDRITZ reduce risk and accelerate time-to-market for its partners?**
Scaling an extraction process is indeed one of the greatest challenges in the industry. This is where ANDRITZ clearly goes beyond the role of a traditional equipment supplier.

At our FIX, customers can conduct investigative trials and analytical measurements using advanced technologies and automated systems, supported by our team of process experts and food chemists. Complemented by our Turbex mobile unit for on-site pilot testing, we help reduce technical and financial risks long before a full-scale plant is commissioned.

Want to know more about the Turbex system?
→ **read article on page 32**


ANDRITZ's Turbex mobile unit

Once a process is proven viable, we support the transition to industrial scale with a complete solution approach – providing basic engineering, defining the overall process concept, and integrating key process equipment into the customer's production environment. Comprehensive training, start-up assistance, and process supervision ensure reliable performance from day one.

**How do you see the market for functional nutrients and circular business models developing in the coming years?**
The trend toward a healthier and more sustainable lifestyle is accelerating. Consumers are increasingly willing to invest in functional foods and beverages that support wellbeing and align with values like animal welfare and environmental responsibility.

The number of products in this segment continues to grow rapidly, and the global market shows sustained expansion. As the realization spreads that circular use of biomass is both a sustainability imperative and a powerful profit driver, companies that industrialize value from side streams will be best positioned for long-term success. With ANDRITZ as a strategic partner, our customers are not just adopting new technologies – they are transforming their business models for a circular, profitable future.

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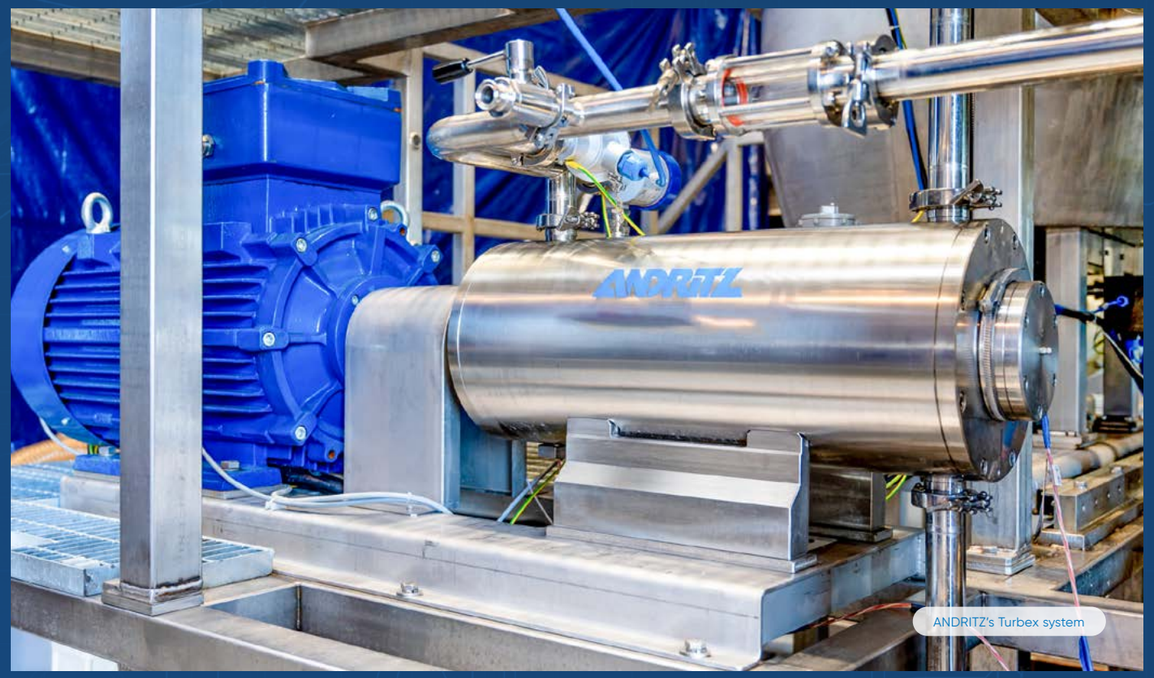
# FOOD WASTE, DISRUPTED.

## Extracting its hidden value.

**Tea leaves: some people use them to predict the future, but you could also use them to help create the future. A better future for everyone. They are just one example of a material usually thrown away as waste, but which actually still contain huge amounts of valuable goodness.**



ANDRITZ's Turbex system

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**Optimized valorization of functional ingredients:** Disruptive extraction is both faster and gentler than other ways of separating solid and liquid extracts.

Even after they have been steeped to make tea, tea leaves are still rich in proteins, dietary fibre, and bioactive compounds like polyphenols. Far from being useless waste, these useful materials can become important ingredients in cosmetics and nutritional supplements. All you need is a way to extract them.

The latest, most efficient way to do this is a technology known as disruptive extraction. In disruptive extraction, the used tea leaves – or fruit peel, or olive leaves, or spent coffee grounds – are immersed in a flow of liquid solvent, usually water. The solvent flows over the material in one direction, while a series of rotors push the other way, against the current, agitating the solvent, causing turbulence and surges of tiny air bubbles.

The immersion and agitation dissolve the useful compounds from the material into the solvent. You can then collect two things from the extractor: the liquid extract with its dissolved useful compounds, and the remaining solid material, squeezed dry and compacted into a solid brick.

### GENTLER, MORE EFFICIENT EXTRACTION

Disruptive extraction is both faster and gentler than other ways of separating solid and liquid extracts.

It is gentler, because the turbulence, high shear and tiny air bubbles (= hydrodinamic cavitation) created by the counter current flow and special profiles of rotors/stators mean the whole process can work at lower temperatures. Traditional higher temperature extraction tends to oxidise the extracts, degrading them. Lower temperature but higher activity extraction gets you the best quality extracts – which can become ingredients in premium products. Thanks in part to the lower operating temperatures in the range of 20/25 °C, disruptive extraction also uses 30 % less energy than traditional processes.

And it is faster: partly because those millions of tiny air bubbles dissolve the useful compounds out of the material more efficiently – extracting 50 % more than other processes can manage – and partly because disruptive extraction is a one-step process. You only need one machine. The material goes in one intake, solvent goes in another, the extractor does its work and out comes your solid and liquid extracts.

### SOLID/LIQUID EXTRACTION WITH TURBEX

This disruptive extraction principle comes to life in the Turbex, ANDRITZ's patented solid/liquid extractor designed for maximum efficiency and yield. Powered by cavitation in a counter-current flow, Turbex enables one-step extraction with minimal energy use, delivering high-quality functional ingredients from by-products in record time. Its ability to boost yield by up to 50 % and reduce energy consumption by up to 30 % makes it a game-changer for sustainable, profitable food production.

At the Food Innovation Xperience Center (FIX), businesses can test the Turbex extractor and explore optimal processing setups before investing. For occasional or time-sensitive extractions, the skid-mounted Turbex mobile unit offers flexibility and can be easily moved by forklift. For more integrated operations, the Turbex pilot unit – with its built-in soaking system – can be installed directly into production lines, enabling continuous processing of various raw materials.

### IMAGINE A WORLD WHERE EVERYTHING IS USEFUL

It is a true mindset shift to look again at a material your whole industry dismisses as waste and see it afresh as a source of valuable by-products. If processed the right way, instead of being thrown away, tea leaves, fruit peel, coffee grounds, and more can become sources of new products, new revenue, and a more circular, sustainable way of doing business.

It is a shift that is essential for today's world. When we discover the value, we can extract from the material we traditionally discard, not only does it reduce waste, it also reduces the need to manufacture the extracted ingredients – polyphenols, proteins, and other complex compounds – by other, more energy-intensive means.

A world where everything is useful is a more sustainable world, and Turbex technology is making that world possible today.

**ANDRITZ Turbex**
The ANDRITZ Turbex is a patented solid/liquid extractor powered by cavitation in a counter-current flow. This results in higher yields, shorter processing times, and improved product quality.

**ANDRITZ EXPERT:**

→ **Massimo Secondo**
Product Manager
Turbex, Separation

# ONE SYSTEM.
# ONE LANGUAGE.
# ONE FUTURE.

**Bringing all machines under a single, integrated solution sets the stage for next-generation feed production.**

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Business runs more smoothly when information moves freely, and everyone works towards the same goal. The same logic applies to industrial plants: when machinery and processes are coordinated under a unified control system, decision-makers gain a clearer view of operations and can act faster and more precisely.

As the feed industry evolves, manufacturers are looking for more than isolated automation at machine level. They want a unified, plant-wide platform that gives them visibility, consistency, and the ability to operate at higher levels of efficiency and safety. This shift isn't just about digital tools – it's about enabling the feed mill of the future.

## EXPERIENCE BUILT ACROSS INDUSTRIES

Plantwide control is relatively new to the feed sector, but it is long established in industries such as pulp & paper, metals, and automotive manufacturing. ANDRITZ has implemented automation and digitalization across these environments for decades, supporting higher productivity, intelligent quality control, and, in some cases, near-autonomous operation.

A key reason this experience transfers effectively is the shared digital backbone and development philosophy across ANDRITZ business areas. Expertise developed in one industry provides solutions in another, allowing feed mills to benefit from technologies and adopt capabilities that were proven long before the feed sector began requesting them.

## FROM ISLANDS OF AUTOMATION TO INTEGRATED PLANT SOLUTIONS

For feed producers, those technologies represent a shift from a collection of individual systems to a complete turnkey plant solution. A solution with all the capabilities essential to gaining a competitive edge in the industry, including:

- seamless plant-wide data flow
- consistent quality tracking and documentation
- coordinated process control from intake to load-out
- faster response to deviations
- reduced reliance on manual interventions

**Feed mill of the future**
The feed industry is shifting from isolated machine automation to fully integrated, plant-wide platforms that deliver greater visibility, consistency, and efficiency for the feed mill of the future.

## TRACK AND TRACE: ONE EXAMPLE OF CROSS-INDUSTRY STRENGTH

Traceability is just one capability strengthened by cross-industry collaboration. Originally developed within ANDRITZ's Metals business – where identifying defects in real time is critical – our track & trace module has been tailored for feed mill workflows and regulatory frameworks. It provides instant, audit-ready reporting and deeper visibility into raw material usage and product movement.

But the real value of capabilities like track and trace comes from being part of a broader, integrated platform, where every process speaks the same language.

## PAVING THE WAY FOR AUTONOMOUS OPERATIONS

Over the long term, manufacturing systems will increasingly anticipate, adjust, and optimize production, with minimal interference from humans. Harmonizing data plant-wide, standardizing digital workflows, and installing control software proven in multiple industries will allow feed mills to join this global evolution.

**A complete, integrated plant solution is the foundation for smarter, safer, and eventually autonomous feed mill operations.**

It will mean fewer unplanned stops, smarter use of raw materials, faster correction of deviations, and processes that steadily optimize themselves.

These are early steps towards truly autonomous feed mill operations – and they all begin with complete, integrated, plant-wide controls.

## A SMARTER WAY FORWARD

Integrated plant solutions bring together proven automation, digital expertise, and industry know-how to give feed producers the clarity and confidence of world-class manufacturing.

It's not about a single feature, it's about a future-ready platform that drives growth, ensures compliance, and lays the foundation for the next generation of feed mill operations.

**Path towards autonomous mills**
Fully integrated plant-wide control systems are the first steps on our path towards fully autonomous mill operations.

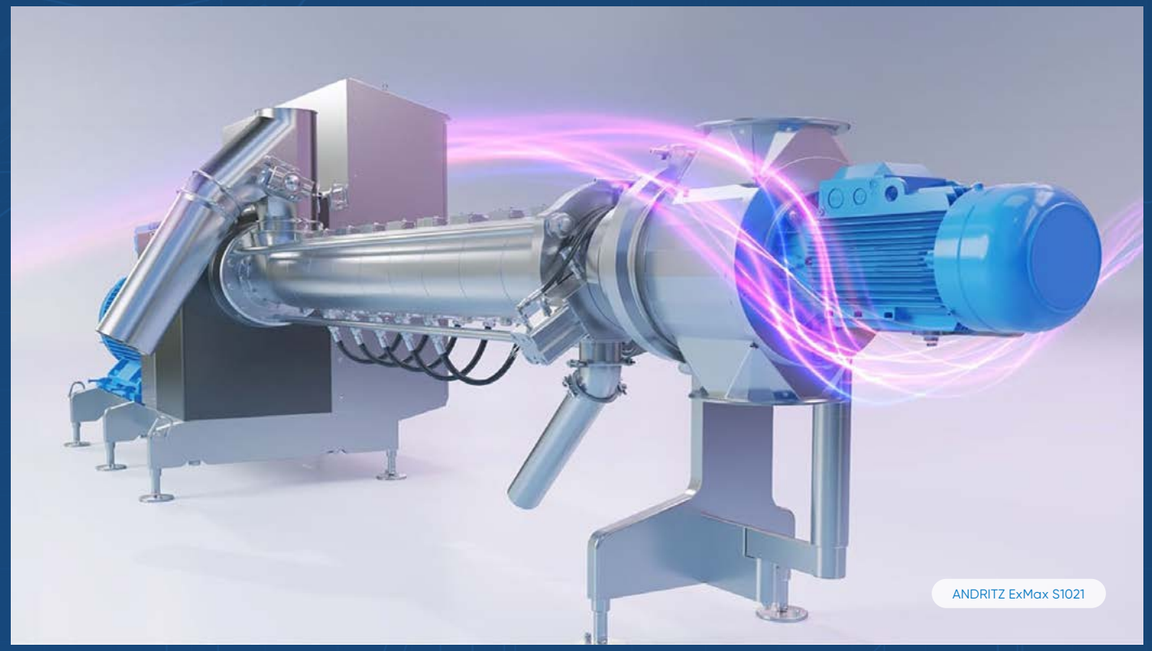
**ANDRITZ EXPERT:**

→ **Ranjit Maharajan**
Head of Product Group Automation Solutions, Feed & Biofuel

# EXTRUSION SOLUTIONS

## For healthy pets, healthy profit and a healthy planet.

**Are pets getting pickier – or is it their owners? Either way, the demands on pet food producers are getting tougher, and pet food production technology is advancing to match.**


ANDRITZ ExMax S1021

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**Innovation drives profitability**
ANDRITZ's latest extrusion innovations are designed to help protect pet food producers' margins.

Pet owners expect the very best for their furry (or finny) friends. And they have the backing of governments, many of which are pushing for higher standards by more strictly regulating cleanliness, hygiene, and safety on pet food production lines.

Working to meet higher expectations and stricter regulations pays off in the form of a higher quality product but can eat into the producer's cost-effectiveness. As with most consumer goods products, the margins on pet food are precisely calculated. So, when external pressures change the maths, something needs to change on the production line as well, to bring everything back into balance.

The best solution is to improve efficiency. To put it simply: stop the production line less often, and for less time, so it can produce more per shift.

That's easier said than done for pet food producers, who might have to keep stopping production to switch between different recipes and formats. The ingredients, the cooking conditions, and the size and shape of kibble bits might all need recalibrating at each changeover.

### THE EXTRUSION PROCESS – HOW PET FOOD TAKES SHAPE

Most dry pet foods are made using a process known as extrusion. Extrusion is a continuous process that combines mixing, cooking, shaping, drying, and coating.

Industrial extruders mix food ingredients to form a dough, cook the dough at high temperature and pressure, push the cooked dough through a die and a sharp knife that cuts it up like a cookie cutter, and finally dry it ready for bagging.

This process ensures consistent texture and nutritional quality, but it also introduces challenges. Switching between recipes – different ingredient mixes, cooking conditions, or kibble sizes – requires adjustments that often mean stopping the line. Each pause reduces overall productivity and can impact margins.

### RESTART FASTER AFTER DOWNTIME WITH DENSIFLEX™

When switching recipes, some downtime is inevitable - but its impact can be minimized. ANDRITZ's DensiFlex system enables instant, safe pressure release inside the extruder, making changeovers faster, easier, and safer.

Instead of manual intervention, DensiFlex automatically adjusts die plate pressure to control starch cooking and dough expansion according to the recipe. This boosts safety, hygiene, and product consistency.

Real-time adjustments maintain quality from the start of each batch. If conditions fluctuate after a changeover, the system quickly stabilizes them, reducing waste and ensuring uniform results. Less manual handling further improves hygiene and operator safety.

### ALL IN ONE: THE EXMAX S1021

To maximize cost-effectiveness, every consequence of every change must be considered. Reducing downtime improves efficiency but longer runs can increase energy use and maintenance needs. The ANDRITZ ExMax S1021 addresses this balance with DensiFlex integrated as a standard feature. The ExMax is now complementing a comprehensive portfolio of single- and twin-screw extruders, covering everything from dry ingredient processing to high-meat formulations.

The ExMax S1021 uses a direct-drive IE4 motor for minimal energy loss and an automatic lubrication system to reduce wear and extend service life. This means lower energy consumption and longer operating cycles, helping control costs and support sustainability. Food-grade materials and stagbolts make cleaning and maintenance simple, while real-time monitoring streamlines upkeep and reduces downtime.

These features allow longer operating cycles with lower energy consumption, supporting both cost control and sustainability goals.

### SUPPORT THE GREEN TRANSITION WITH EFFICIENT TECHNOLOGY

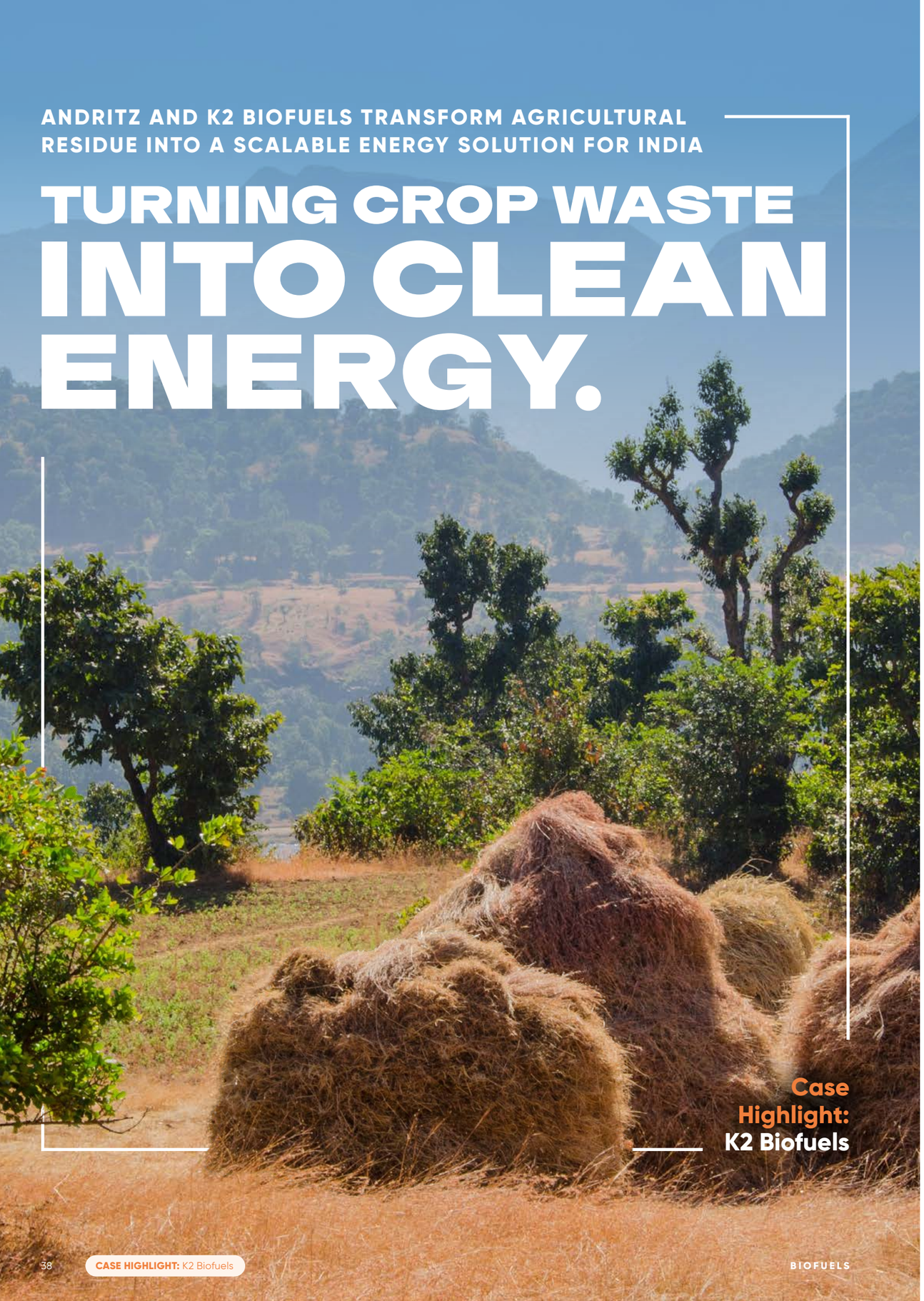
Improving efficiency is not just about economics. It is also about meeting rising standards while reducing environmental impact. As the global green transition accelerates, industries face pressure to use less energy, improve product quality and protect operators, all while running efficiently enough to be profitable.

Advanced technology is key to easing these pressures. By driving efficiency, companies can meet their responsibilities to people and planet without sacrificing profitability. With the right solutions, sustainability and business success go hand in hand – and that benefits everyone.

**ANDRITZ ExMax S1021**
The ExMax combines energy-efficient direct-drive technology, automated lubrication, and integrated DensiFlex to deliver longer, cost-effective operating cycles with minimal downtime and simplified maintenance.

**ANDRITZ EXPERT:**

→ **Gunnar Hallmann**
Industry Director, Aqua and Pet, Feed & Biofuel



ANDRITZ AND K2 BIOFUELS TRANSFORM AGRICULTURAL RESIDUE INTO A SCALABLE ENERGY SOLUTION FOR INDIA

# TURNING CROP WASTE INTO CLEAN ENERGY.

**Case Highlight: K2 Biofuels**



**Each autumn, air pollution becomes impossible to ignore across northern India. The burning of crop residues in Punjab and Haryana sends dense smog across the Delhi National Capital Region, with immediate consequences for public health, mobility, and the environment. What has long been treated as an unavoidable seasonal problem is now being addressed through industrial-scale solutions.**

K2 Biofuels, working in partnership with ANDRITZ, is converting agricultural waste into clean-burning biomass pellets. Transforming an environmental liability into a dependable energy resource and offering a practical alternative to open-field burning.

## FROM AIR POLLUTION TO ENERGY RESOURCE

Rice straw and mustard husk are abundant by-products of agriculture in northern India. With narrow harvesting windows and limited disposal options, farmers have traditionally relied on burning these residues in the fields. While fast and inexpensive, the practice releases large volumes of particulate matter and is a major contributor to seasonal smog.

K2 Biofuels set out to change this equation by creating sustained industrial demand for these materials. The idea was simple but ambitious: collect agricultural residues at scale, process them into usable biofuel pellets, and integrate them into India's existing energy infrastructure.

> *This is an important project not just for us, but for national sustainability goals. We needed a partner with proven, scalable technologies and deep understanding of India's market dynamics.*
>
> **Rajpal Yadav**
> Director, K2 Group of Industries

To make this vision a reality, K2 Biofuels partnered with ANDRITZ in 2024 to develop a new greenfield biomass pelleting plant in Haryana – designed specifically to handle challenging agricultural waste reliably and at industrial volumes.

## ENGINEERING A RELIABLE BIOFUEL PLANT

Processing rice straw and mustard husk is technically demanding. Both materials have high moisture content, variable composition, and tough fibrous structures that complicate drying, grinding, and pellet formation. Without carefully engineered process control, output quality and plant uptime can quickly suffer.

ANDRITZ delivered the complete biomass pelleting plant as an integrated project, covering engineering, equipment supply, installation, and commissioning. The plant process includes raw material preparation, drying, size reduction, pelleting, cooling, screening, automation, and packaging, giving K2 Biofuels a single point of responsibility for the entire facility.

The plant is engineered to process three distinct raw materials: rice straw, mustard husk, and wood logs. This makes it the first facility in India capable of handling such diverse biomass streams within one integrated system, ensuring flexibility despite seasonal and quality variations in raw materials supply.

## MEASURABLE ENVIRONMENTAL AND ENERGY IMPACT

The Haryana plant processes up to 210 tons of agricultural residue per day. Instead of being burned in open fields, this material is converted into biomass pellets used for co-firing in National Thermal Power Corporation (NTPC) thermal power stations.

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**One partner – full solution**
ANDRITZ delivered a fully integrated biomass pelleting plant that uniquely processes rice straw, mustard husk, and wood logs in a single turnkey facility.

**Turning waste into fuel**
The plant converts 210 tons of agricultural waste per day into renewable biomass fuel for NTPC power stations, transforming local residue burning into a positive outcome for the community.

**SCAN HERE** for videotour of the site

Crop residue

Combustion still occurs, but under controlled industrial conditions that deliver usable energy while significantly reducing environmental impact. The results are tangible: lower air pollution during peak burning season by farmers, reduced reliance on fossil fuels, and new revenue streams for agricultural waste. Rural communities benefit not only from cleaner air, but from participation in a growing renewable energy value chain.

## TECHNOLOGY BUILT FOR OPERATORS

ANDRITZ supplied key equipment including chippers, hammer mills, pellet presses, coolers, screens, and packaging lines. A programmable logic controller–based automation system integrates the full process into a single control platform, allowing operators to manage the entire plant through centralized dashboards.

The design emphasizes high availability, energy efficiency, and low wear rates. Durable components, optimized layouts, and real-time monitoring reduce operating costs while supporting long-term reliability under demanding operating conditions.

## LOOKING AHEAD

Following the successful execution of the Haryana pellet plant, K2 Group of Industries has announced plans to expand into advanced biofuels through a separate ethanol venture. ANDRITZ has been awarded responsibility for the engineering, procurement, construction, and commissioning of this future project, which is currently in the early development phase.

The planned facility is designed to use biomass instead of fossil fuels for process energy, creating a closed-loop manufacturing model. While distinct from the pellet plant, the project builds directly on the technical experience, operational insight, and partnership established in Haryana.

## PARTNERSHIP DRIVING CHANGE

The Haryana biomass pellet plant demonstrates how targeted engineering and local collaboration can convert an environmental challenge into a scalable industrial solution. For K2 Biofuels and ANDRITZ, the project shows that large-scale biofuel production can support cleaner air, reliable energy supply, and rural economic development, without relying on unproven concepts or short-term fixes.

Each autumn, the impact becomes visible. Less smoke. Clearer skies. And steady progress toward a more sustainable energy system for India.

*Both projects showcase how tailored engineering and local collaboration can accelerate India's clean energy transition.*

**Pavan Kumar Pawar**
Vice President,
South Asia, Feed & Biofuel

**Engineering impact**
The K2 partnership underscores ANDRITZ's commitment to sustainable industrial transformation, demonstrating how advanced engineering can turn environmental policy into real-world benefits - from cleaner air to reduced fossil dependence and stronger rural economies.

**ANDRITZ EXPERT:**

→ **Pavan Kumar Pawar**
Vice President
South Asia, ANDRITZ
Feed & Biofuel


ANDRITZ Hammer mill

PELLET PLANT

## Complete biomass plant delivery

**Capacity:** 210 tons /day of agricultural waste (rice straw, mustard husk)

**Output:** Biomass pellets for co-firing in NTPC thermal power stations

**ANDRITZ Scope:** Complete turnkey solution including: Chippers, hammer mills, pellet presses, coolers, screens, packaging lines. The scope also includes an integrated automated plant control system with single-user interface and digital dashboards for easy operation

ANDRITZ Pellet mill

Wastewater pump selection:

# TIME FOR A RETHINK?

**Efficient, reliable pumping systems are the heartbeat of modern wastewater treatment plants. They help purify the water we can't live without – but they also account for a significant share of total plant energy use.**

**SCAN HERE** for digital article

Yvonne Tripolt, Industry Segment Manager Waste- & Sewage Water, Pumps at ANDRITZ discusses how ANDRITZ's new approach can cut energy use dramatically while maintaining reliability and efficiency.

**Let's start with a big picture question: can you give us a sense of the scale of the global wastewater industry?**

Exact figures are difficult to pin down but estimates suggest a worldwide market of roughly USD 9 to 16 billion, translating to between 1.5 and 3 million pumps sold every year. That gives an idea of the sheer scale – and of the energy involved in moving and processing wastewater globally. In every treatment plant, pumps influence almost every stage of purification, so improving their efficiency can have a huge cumulative impact.

**What are the different types of pumps, and what are the differences between them?**

There are two main types of pumps: positive displacement pumps and centrifugal pumps. In wastewater applications, both are used – centrifugal pumps are typically used for more fluid wastewater, while positive displacement pumps handle higher sludge concentrations.

In the past, the focus for wastewater pumps was having a large free-ball passage diameter and low blade numbers (both of which affect the size and density of the solids it could handle) – and how reliable the pump itself was. But there is a tension between the choices: the larger the diameter and the fewer the blades, the lower the hydraulic efficiency. (For example, vortex pumps have an efficiency of about 50 %.) In the past, it made sense to go with those big diameters and low blade numbers, because screening was less effective than it is now, so more (and tougher) solids were going through the pumps.

That's changed now though. Prescreening at the plant entrance removes most debris – in the best case down to mesh sizes of around three millimeters – so we can often move beyond those traditional pump designs.

**And would you say that customers are always aware of that progress?**

That's a really interesting challenge for us. So, for example, order specifications are often copied from old tenders. Customers might order a "two-blade semi open-impeller with a 100 millimeter passage" without really checking if that's still the best option. Suppliers then deliver exactly what they've been asked to deliver, without asking any further questions or going into the details of what the client needs from their pumps.

**Rethinking pump efficiency**
Pump selection in wastewater plants has a far bigger impact on energy use than many operators realize, making efficiency gains a powerful lever for sustainability.



**WASTEWATER** | **ENERGY OPTIMIZATION** | **LIFECYCLE EFFICIENCY**


## YVONNE TRIPOLT

Industry Segment Manager
Waste- & Sewage Water, Pumps

Working at ANDRITZ's Graz office for eight years now, Yvonne Tripolt combines academic rigor with practical expertise to transform wastewater management. With a master's degree in process engineering from TU Graz and a PhD from TU Berlin, her research on "Energetic and Technical Potential in the Selection of Centrifugal Pumps in Wastewater Treatment Plants" uncovered how smart pump selection can dramatically improve energy efficiency and reliability.

Today, Yvonne applies these insights to help operators rethink pump choices – driving sustainability and performance across the industry.

### PROFESSIONAL FOCUS

Yvonne champions innovation in wastewater pump technology, leveraging advanced hydraulic design to optimize energy efficiency and reliability. Her work bridges engineering excellence with sustainability, ensuring pumps meet the evolving needs of modern treatment plants.

### PURPOSE IN ACTION

Through solutions like the ACP pump series, Yvonne and her team adapt high-efficiency industrial hydraulics for wastewater applications. These pumps deliver up to 83 % efficiency compared to 45 % for conventional designs, enabling treatment plants worldwide to achieve significant energy savings while maintaining operational stability.

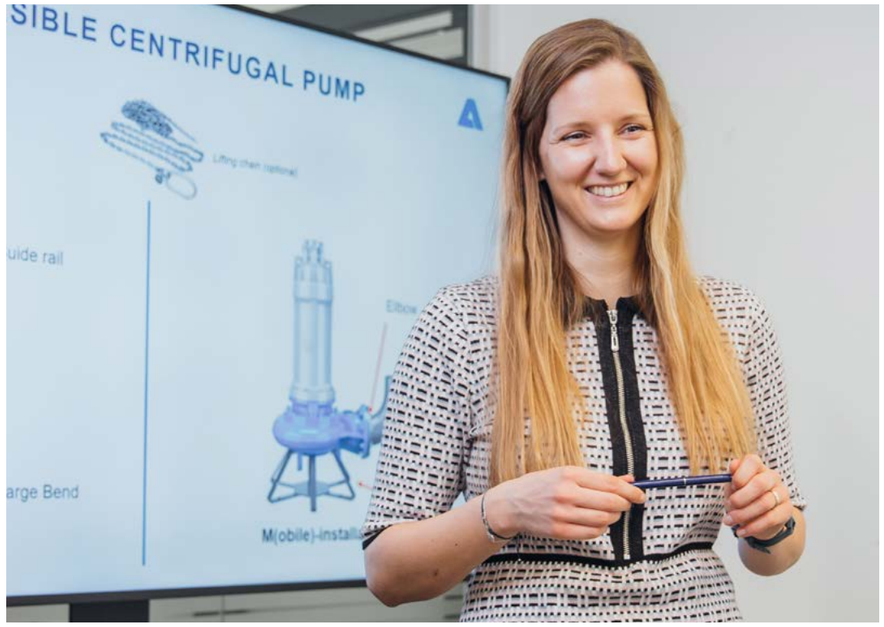
### WHY IT MATTERS

Pumps account for roughly 25 % of a wastewater plant's electricity use. By rethinking traditional designs and challenging outdated specifications, Yvonne's work helps operators cut energy consumption of their pumps by up to 30 %, reducing costs and environmental impact across the industry.

### VISION FOR THE FUTURE

Yvonne envisions a wastewater industry that embraces precision and sustainability – where pump selection is based on real process data, not legacy specs. Her goal: to make wastewater treatment smarter, greener, and more resilient, supporting global efforts to conserve resources and protect water quality.

**Industrial hydraulics advantage**
Adapting industrial centrifugal pump designs to wastewater applications can more than double efficiency compared to conventional vortex pumps.




Our role at ANDRITZ is to open that conversation and ask: What kind of media are you really pumping? Once we understand that, we can advise whether a conventional non clog wastewater pump is justified, or whether a single stage industrial centrifugal design might perform better. In many cases, the latter option is both more efficient and equally reliable.

**Open-minded specifications needed**
As regulations, treatment stages, and operating conditions evolve, operators and consultants must move beyond 'never change a running system' thinking.

**It sounds like you're trying to strike a balance between respecting customer choices and also offering your own expertise?**
Exactly. Ultimately, our main goal is the same as the customer's – finding the best pump solution for their needs. And when we say 'expertise' we're not just talking about our expertise in pump technology – we want to show that we understand how the pumps fit into the broader changes across the entire market.

To give an example, around 20 or 30 years ago we had a very different approach to rainwater – it was just allowed to flow into wastewater treatment plants if there was heavy rainfall. Whereas now, heavy rainfall is more likely to be stored separately and only sent to the wastewater plant when the weather has improved, so as not to affect the overall process. That opens the door to conversations about how our products can help meet shifting priorities and needs.

**And new regulations probably fit into that picture too?**
Exactly. For example, in Europe, the upcoming fourth cleaning stage, aimed at removing micropollutants such as hormones and pharmaceuticals, must be implemented by 2035 for larger plants. That means wastewater arriving at this stage is already very clean – almost drinking water quality – so specifying pumps with huge passages no longer makes sense. So, we're really aware of how the overall industry has changed and how different pumps are more relevant now. It's just customers often have an 'if it isn't broke, don't fix it' (or a 'never touch a running system') attitude, and are happy to stick with the same pump they've used for years, if not decades. But often that isn't the most efficient approach!

**How much energy could operators be wasting simply by not re-evaluating their pump choices?**
Based on studies I carried out during my doctoral research and subsequent field work, there is potential to reduce energy consumption of the pumps by up to 30 percent simply by selecting the right hydraulic design and matching it accurately to each duty point. In wastewater treatment, roughly a quarter of total electricity is consumed by pumps, so the potential savings are substantial.

## In every treatment plant, pumps influence almost every stage of purification, so improving their efficiency can have a huge cumulative impact.

**Beyond energy use, how does correct pump selection influence reliability and maintenance?**
The easiest way to measure reliability is how often you have to handle the pump – ideally once it's installed, you'll hardly ever have to touch it! But if you choose the wrong type, you'll be intervening frequently. Select the right one, and it can run five to ten years with only basic annual checks – greasing bearings, verifying seals, things like that. So proper selection dramatically improves uptime.

**Customers are often afraid of high investment costs – is that a valid concern?**
That's another misconception. We compared costs when replacing traditional vortex pumps with our single stage centrifugal pumps and found that the capital expenditure is effectively the same. So, operators are not paying more up front, but they are gaining significant long term savings through higher efficiency.

**Tell us a bit more about the ACP series and how it boosts performance.**
Our ACP pump series was developed by adapting existing industrial hydraulics to wastewater applications, which ended up in two new impeller types specially developed for wastewater. Where a typical vortex pump achieves around 45 percent efficiency, the ACP design reaches up to 83 percent.

That means significant energy savings while maintaining operational stability. We've already proven this in replacement projects, for example switching from vortex to ACP pumps at plants in Brazil and in Graz, Austria. Without naming customers, I can say the results have been consistently positive.

**How does your team support customers in practice?**
We can act as consultants if clients involve us early enough. When they tell us where in the process the pump will be located and what kind of media they expect, we analyze the data and recommend the most suitable pump type and hydraulic design. The advantage we offer is we have the complete range – from conventional non clog wastewater pumps to highly efficient industrial designs.

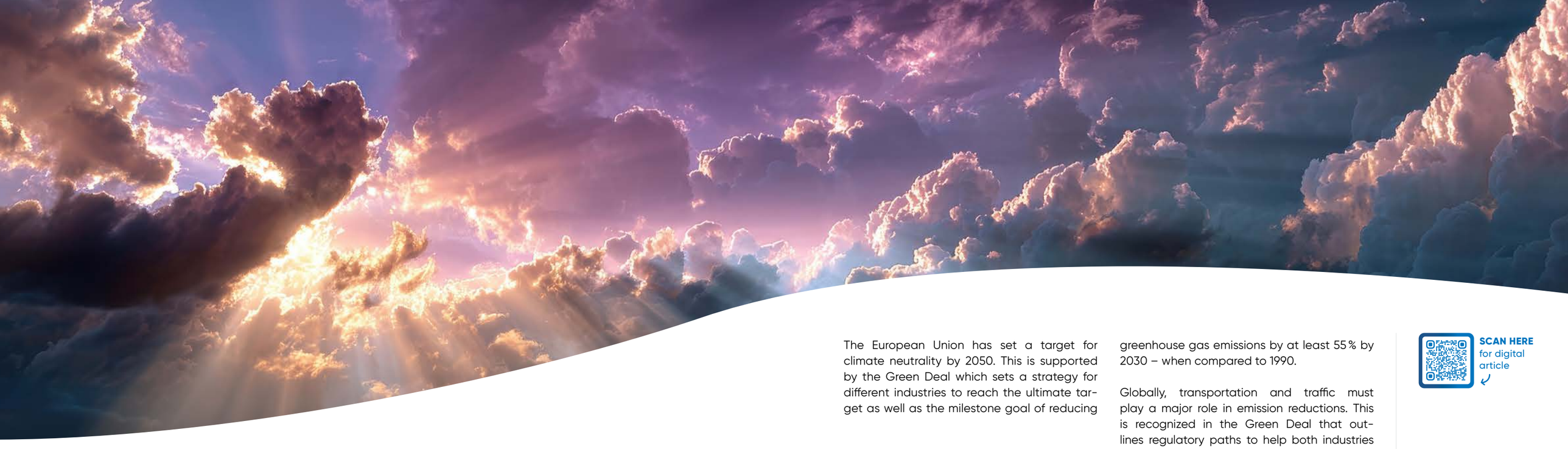
**What would you like plant operators and consultants to take away from this discussion?**
We need to be more granular about wastewater, because it's not one single type of thing. Even the categories of 'screened' and 'raw' are too broad I would say. The more specific we can be, the better we can tailor the equipment we offer.

Wastewater will always be with us – no matter how sensible we are with our showers, for example, we can still only reduce it, not eliminate it. But we can treat and move it much more efficiently. And my main ask for anyone reading this would be to be open minded! We can make a huge difference by using the latest technology, which ultimately benefits all of us.


ANDRITZ single-stage centrifugal pump

**Right design saves energy**
Choosing hydraulics that truly match the pumped media can cut pump energy consumption by up to 30 % without compromising reliability.

**Efficiency without cost penalty**
High-efficiency pumps often come with capital costs comparable to traditional designs, but deliver substantial long-term operating savings.



## BIOGENIC $CO_2$ IS THE MISSING INGREDIENT FOR THE RENEWABLE FUEL INDUSTRY

# STRIVING FOR 1.5°C

To restrict global warming to the maximum of 1.5 °C as stated in the Paris Agreement, global carbon emissions need to be reduced by 43 % by 2030, with net zero reached by 2050. At ANDRITZ, we believe that reaching this goal calls for more than just promises. It requires resilient infrastructure, strong investment, and robust industrial execution. This is the only way that potential solutions, like capturing biogenic $CO_2$, can be turned into profit and become true game changers in reaching the world's climate targets.

The European Union has set a target for climate neutrality by 2050. This is supported by the Green Deal which sets a strategy for different industries to reach the ultimate target as well as the milestone goal of reducing greenhouse gas emissions by at least 55 % by 2030 – when compared to 1990.



*Over 80 % of global trade is transported by sea, with more than 100,000 vessels carrying food, oil, raw materials, and goods every day. Maritime traffic is essential to keep global trade moving, but nearly all ships still run on fossil fuels. Finding sustainable alternatives is no longer optional; it is a must.*

**Klaus Bärnthaler**
Director Proposal & Business Development, Carbon Capture, ANDRITZ

Globally, transportation and traffic must play a major role in emission reductions. This is recognized in the Green Deal that outlines regulatory paths to help both industries towards a low-emission future.

Road traffic is already on route for electrification. But the situation with aviation and shipping is more complex. They are recognized as hard-to-abate sectors and are not currently viable for electrification. They are also causing significant emissions with the shipping sector amounting to about 2.9 % and aviation to about 2.5 % of global $CO_2$ emissions.

One of the most promising solutions is e-methanol produced from biogenic $CO_2$. As our Director of E-methanol Henrik Grönqvist emphasizes: "We cannot achieve climate neutrality without replacing fossil fuels with renewable alternatives. Fuels made from green hydrogen and biogenic $CO_2$ are essential to decarbonize hard-to-abate sectors like shipping and aviation."

### E-METHANOL TURNS BIOGENIC $CO_2$ FROM EMISSIONS TO A RAW MATERIAL FOR FUEL

E-methanol is a renewable, low-carbon fuel that can be used in both shipping and aviation. It is produced using biogenic $CO_2$ that originates from biomasses. Unlike fossil $CO_2$, biogenic $CO_2$ is part of the natural carbon cycle and as such doesn't add to the total amount of $CO_2$ in the atmosphere. As raw material it is sustainable and widely available. The global pulp industry, for example, emits around 200 million tons of biogenic $CO_2$ every year.

**SCAN HERE** for digital article

**Transforming emissions into economic growth**
The pulp and paper industry emits around 200 million tonnes of biogenic $CO_2$ every year. What if this wasn't waste but a resource?

**Producing e-methanol from biogenic $CO_2$**
The future of $CO_2$ isn't solely about avoiding it. It's about using it wisely.

There are credible signs that the demand for e-methanol is on the rise. For example, several major global shipping companies are already investing in vessels that use e-methanol and in 2024, there were 195 e-methanol powered vessels on the order books at shipyards. Furthermore, it is estimated that in Finland, commercializing biogenic $CO_2$ could increase the forest industry's revenues by 58 %.

### THE TECHNOLOGY IS ALREADY THERE BUT WHO WILL BE THE FIRST TO SEIZE THE OPPORTUNITY?

ANDRITZ's most recent innovation is in capturing the biogenic $CO_2$ produced by the pulp industry so that it can be used as a raw material in P2X (Power-to-X) processes that produce sustainable, synthetic fuels, such as e-methanol. This technology is already being successfully piloted in Finland. It is scalable and ready for industry-wide use. The next step is to put it into practice.

New solutions for cleaner heavy industries do not just help businesses align their operations with tightening regulatory requirements. They help cut costs – and even create new profitable products. The key to solving this dilemma is in the hands of technology and engineering companies, such as ANDRITZ, with biogenic $CO_2$ and e-methanol as living proof.

With the costs of climate change already on the rise, solutions that both mitigate climate change and create value are worth their weight in gold. The market is waiting, and the math is simple: The first movers to utilize them will reap the highest rewards.

*Capturing biogenic $CO_2$ from pulp mills to produce e-methanol is a win-win: it reduces emissions from pulp mills, cuts emissions from shipping and aviation, and provides a renewable fuel that lowers reliance on imported oil and gas.*

**Henrik Grönqvist**
Director E-Methanol,
ANDRITZ

**ANDRITZ EXPERTS:**

→ **Henrik Grönqvist**
Director E-Methanol

→ **Klaus Bärnthaler**
Director Proposal & Business Development, Carbon Capture

Do you want to find out why biogenic $CO_2$ is the new green gold?

**→ Please scan the QR code to read our expert article on how to capitalize on the role of biogenic $CO_2$ in e-methanol production.**





# DOUBLING THE VALUE FROM WOOD

## WITHOUT HARVESTING MORE TREES

**ANDRITZ is partnering with leading research institutes, companies, and universities to reach this bold mission.**

**SCAN HERE** for digital article

**ANDRITZ BioCircleToZero leading company program**
The program supports the transition of pulp mills into sustainable biorefineries – doubling the value from wood without harvesting more trees.

**ANDRITZ EXPERT:**

→ **Johan Engström**
Chief Technology Officer, Pulp & Paper, ANDRITZ Finland, BioCircleToZero Program Lead

Changes in global trade conditions and market uncertainty have driven up the cost of raw materials across Europe. For ANDRITZ, this is a clear signal: there must be ways to create more value from every ton of wood used at pulp mills – without increasing forest use. That's where BioCircleToZero comes in.

### DRIVING A CIRCULAR BIOECONOMY

BioCircleToZero is a five-year research & development program funded with MEUR 10 by Business Finland and designed to accelerate innovation in the bioeconomy. Its goal is simple yet ambitious: to build a next generation biorefinery ecosystem that maximizes the value of wood while reducing environmental impact.

Johan Engström, Chief Technology Officer, ANDRITZ Pulp & Paper in Finland says, "We simply have to get more value out of the wood being used at pulp mills. One of the most straightforward ways to address this challenge is to burn less wood-based material in the process, increase the pulp yield, utilize side streams, such as lignin and biomethanol, or increase the value by high-value products like man-made textile fibers."

**We're not just improving pulp mills. We're reinventing what a biorefinery can be.**

While some biomass will always be used for energy, biogenic $CO_2$ from combustion can be combined with green hydrogen to produce eFuels.

### BUILDING A NEXT-GENERATION BIOREFINERY ECOSYSTEM

At its core, BioCircleToZero is about cooperation. ANDRITZ is leading the initiative, but success depends on collaboration among companies, research institutes, and universities working in forest products, energy, climate, and environmental fields.

"This is an extremely important initiative", says Kari Tuominen, CEO of ANDRITZ Finland. "With BioCircleToZero, we are building a large ecosystem where it is not only us bringing new technology to market. Our partners are also key in any new development that enables the creation of added value from wood."

**SHAPING THE SHIFT:** BioCircleToZero

# THE SHIFT SNIPPETS

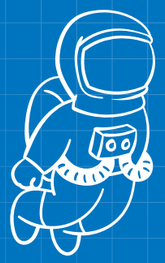
## POWER ON THE SLOPES: INNOVATIVE ENERGY SOLUTIONS IN SKI RESORTS

**Did you know ski resorts can boost their energy independence by turning snowmaking ponds into pumped storage systems?**

Traditionally, these systems are known for bigger scale, but innovative solutions now make it possible to use existing smaller ponds for energy storage.

With rising energy demands and the push for renewables, ANDRITZ provides pumping technology adapted for smaller-scale applications – helping ski resorts store and generate power efficiently while promoting sustainable resource use in alpine regions.

## BLUER SKIES AHEAD – WITH CLEAN AIR TECHNOLOGIES!



**Did you know astronauts aboard the International Space Station can actually see smog from space?**

*Air pollution over major cities is visible from orbit and in some regions, poor air quality persists for hundreds of days each year. To tackle this, governments are increasingly focusing on measures like "point source control", which targets specific emission sources.*

*ANDRITZ contributes to cleaner air with advanced single- and multistage solutions that help reduce emissions and improve air quality worldwide.*

## SWEET HISTORY: FROM LUXURY ITEM AND MEDICINE TO EVERYDAY TREATS

**Did you know sugar was once a luxury item – and even used as medicine?**

Until around 1850, it was so expensive that only the wealthy could afford it. As prices dropped, sugar transformed from a rare remedy into a kitchen staple, used for preserving, decorating, and sweetening food.

This shift paved the way for the treats we love today! ANDRITZ supports this sweet journey with cutting-edge solutions for sugar processing, helping producers maximize quality and efficiency.



# BEHIND THE BADGE

## How our colleagues from Scorbé Clairvaux turned kilometers into kindness

**Last summer, ANDRITZ Euroslot in Scorbé Clairvaux organized a company-wide trail and walking event, bringing employees together for a meaningful cause. The initiative included trail runs of 8 and 10 kilometers, as well as a 3-kilometer walk, designed to encourage participation across all fitness levels.**

Beyond promoting health and team spirit, the event had a charitable dimension. Proceeds supported Vivre comme avant, an association dedicated to providing emotional support to individuals affected by breast cancer. The contribution reflects the team's commitment to social responsibility and community engagement.

The atmosphere on site was positive and collaborative, with colleagues showing strong participation and enthusiasm. It was a reminder that even small actions – like taking part in a run or walk – can contribute to a larger purpose.

We thank all participants for their energy and generosity. This initiative successfully combined physical activity with solidarity, reinforcing the values of care and commitment that define our workplace culture.


## How early collaboration shapes better APC projects

**In Advanced Process Control (APC), the real work starts well before commissioning. The projects that run best in the long-term are almost always the ones where all involved parties start working together early.**

From the very first project, developed collaboratively, combining process know-how, control expertise, and what's actually happening on site from day one has proven essential. When APC engineers get into the plant early, ask a lot of questions, and see how the process really behaves, surprises have a great way of disappearing before they turn into problems.

A common example is discovering early that operators run a unit differently during night shifts or during feed changes than the model assumes. Catching this upfront makes a real difference, and it's a good reminder that while models behave beautifully, plants tend to have personalities. That kind of early alignment reduces risk, shortens commissioning, and builds operator trust once stable performance becomes visible. New developments and control strategies are consistently reviewed.

Digitalization in Feed and Biofuel has always been proactive rather than reactive, with a clear focus on simplifying development, reducing variability, and supporting early, well-aligned decisions across teams. Ultimately, this makes commissioning feel seamless rather than something to be fixed later.

**ANDRITZ EXPERT:**

→ **Felipe Borquez**
Advanced Process Control Engineer (Cyber Security Expert EMEA) – Feed & Biofuel, Automation & Digitization

# IF YOU KNOW, YOU KNOW...

Scan QR-Code to learn more about the ANDRITZ Environment & Energy Business Area:
**andritz.com/environment-and-energy**

ANDRITZ