

From invisible losses to measurable gains: Why connecting the right technologies matters more than ever

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INTRODUCTION:

In many paper mills, the biggest losses are not the ones you can see. They are hidden in steam systems that have never been fully mapped, in fibre suspensions no one has truly “looked into” in real time, in quality variations that are corrected rather than understood, and in small mechanical components whose failure quietly disrupts production efficiency over time. Operators compensate. Maintenance reacts. Costs accumulate. And yet, in an industry where margins are tight and pressure on energy, raw materials and sustainability continues to rise, these “invisible inefficiencies” are no longer acceptable. What has changed in recent years is not only the availability of new technologies—but the way they can be combined and applied in practice.

This is where KPNB (Komponenten+Partner Nicole Buschmeier), has developed its role significantly. What began as a network connecting suppliers with paper mills has evolved into a structured approach to bringing together technologies, expertise and experience—with one clear objective:

Helping mills achieve measurable improvements without unnecessary complexity.

From Network to Nexus: A Practical Evolution

For over a decade, KPNB has worked closely with paper and board producers across the DACH region, focusing not on selling individual products, but on identifying the right solution for each specific challenge.

This approach has led to long-standing partnerships with highly specialised companies such as Tasowheel, Pixact, Lanex and Anaergia Technologies. More recently, **Brenpower AI** has become a key partner in the field of energy monitoring and optimisation.

As the complexity of customer challenges increased, the idea for close collaboration with like-minded experts developed. This led to the creation of Fiber Nexus, a joint initiative with **PETAX** - Papier Ingenieur Technik GmbH & Co. KG and **wolf heilmann GmbH**.

Fiber Nexus is not a formal organisation, but a working model: a way of combining complementary expertise, coordinating networks, and responding faster and more effectively to real problems in the mill environment.

All three companies combine their expertise and networks in the European market, with a focus on the German-speaking areas.

Understanding the Real Levers in Paper Production

Across the industry, three areas consistently offer the greatest potential for improvement:

- Energy efficiency, particularly in steam systems
- Process transparency and control
- Operational reliability and maintenance

Individually, each of these areas can be addressed with modern technology. However, the real value emerges when they are connected.

KPNB's approach is therefore not to introduce isolated solutions, but to identify where small, targeted interventions can unlock significant benefits—often within existing systems.



Seeing What Was Previously Invisible: Process Transparency with Pixact

One of the most striking developments in recent years has been the ability to analyse fibre suspensions in real time.

Pixact has introduced online process microscopy that allows operators to observe particles, fibres and contaminants directly within the running process. What was previously limited to laboratory analysis is now available continuously and in high resolution.

Real-Time Contaminant Analysis: Pixact at Sappi Ehingen

In modern pulp and paper production, even small levels of contamination can lead to significant quality issues, higher chemical consumption and unstable operation. At Sappi Ehingen, addressing these challenges has been a key driver for the implementation of Pixact real-time image analysis.



Image 1: Pixact Camera Pixscope.

The Pixact system continuously monitors the fibre suspension using integrated camera technology, delivering real-time data on particle count, size and type. By installing measurement points before and after the bleaching stage, Sappi Ehingen gains immediate insight into process performance and can react quickly to deviations. A decisive factor is the customised classification of contaminants, tailored to the mill's specific raw materials, equipment and product portfolio.

In addition to contaminant detection, the system provides real-time brightness trend monitoring and enables efficient evaluation of chemical treatments—reducing laboratory workload and accelerating optimisation cycles.

Following the successful implementation in Ehingen, Pixact systems have also been deployed at other Sappi sites, demonstrating the scalability and impact of real-time fibre monitoring solutions.

For KPNB, this level of individualisation is a key reason for partnering with Pixact. As every mill operates under unique conditions, tailored solutions are essential to achieve meaningful and sustainable process improvements.

Check the QR codes to see what Pixact customers see in their process.

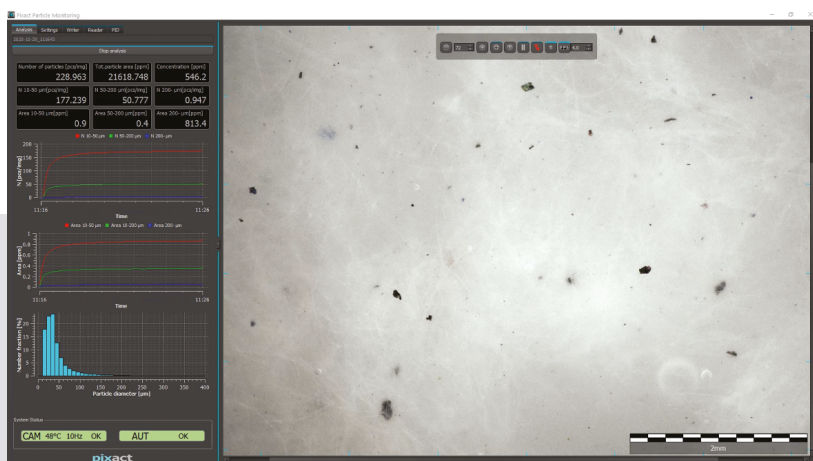


Image 2: Pixact Assembly Works.

Screen Basket Monitoring: Predictive Maintenance, Reducing Web Breaks and Quality Loss

A further step towards increased process reliability was implemented at an integrated pulp and paper mill. Here, a Pixact system monitors the combined accept flow of several screens upstream of the paper machine. The occurrence of unwanted particles in this stream immediately signals a developing issue—such as screen basket damage or advanced wear.

Instead of time-consuming trial-and-error inspection, the source can be narrowed down quickly. Maintenance can then be planned and executed during the next scheduled shutdown, rather than requiring unplanned intervention. This targeted approach not only reduces maintenance effort but also prevents disruptive contaminants from reaching the paper machine—minimising the risk of sheet breaks and quality losses.

Pixact key operational benefits include:

- real-time process transparency and faster corrective actions
- reduced chemical consumption through targeted optimisation
- improved and more stable pulp/stock quality
- significantly lower laboratory workload
- early detection of equipment issues enabling predictive maintenance
- increased production reliability and reduced risk of web breaks

Return on investment:

- payback period of approximately six months
- measurable cost savings in chemicals and process efficiency
- reduced unplanned downtime and improved maintenance planning

Image 3: Pixact Display for Stock Monitoring.

Stabilising Quality Where It Matters Most: Tasowheel's Contribution

While process visibility is essential, control remains equally critical. To control you need to measure – see Tasowheel article on R&D sensor development. (Page 25)

Tasowheel has long been recognised for its expertise in cross-directional control and complete quality control systems. Their strength lies in combining precision engineering with practical usability and flexible integration.

A recent modernisation project illustrates this well. At VPK Oudegem in Belgium, ageing dilution actuator systems had become unreliable, with spare parts increasingly difficult to source. Rather than proposing a full system replacement, Tasowheel implemented a staged upgrade, allowing old and new components to operate in parallel. This approach minimised downtime, reduced investment risk and enabled the customer to maintain production stability throughout the transition.

The result was not only improved profile control and product quality, but also a solution aligned with the mill's operational and financial reality.

Image 6: Digital Slice Gap Measuring Device.



- ✓ Designed for one-person operation
- ✓ Easy to read, also in low light conditions
- ✓ Transfer full profile data to PC
- ✓ Direct slice gap MD profile indication

New Tasowheel Products for better Production and Reliable, User-Friendly Control Devices:

An upgraded Digital Slice Gap Measuring Device has been introduced to support more precise and efficient headbox adjustment. Building on the proven reliability of earlier versions, the enhanced solution offers improved profile visibility, clearer mechanical diagnostics and greater transparency of technical data.



Image 7: Demo Moisturizer Unit.



Image 4: (Above) Joona Mörsky with a Tasowheel steambox before delivery.



Image 5: Eric Garcon, reliability engineer VPK Oudegem.

Designed with operator usability in mind, the device enables efficient single-operator measurement and adjustment, replacing traditional two-person dial gauge methods. In combination with SliceGap software, it provides guided feedback to streamline slice lip alignment and ensure a faster, more consistent workflow.

A key advancement is the improved handling of MD profiles, allowing full slice gap profiles to be visualised and analysed rather than relying on individual measurement points. In addition, enhanced diagnostic features—such as integrated pump testing and backlash detection—provide deeper insight into actuator condition and mechanical performance.

Overall, the upgraded system supports more controlled adjustment processes, contributing to improved stability and performance of the headbox.

Demo Moisturizer Available for Industrial Trials

A demo moisturizer is now available for on-machine trials, allowing producers to technically evaluate performance and ROI prior to purchase.

The trial unit is designed to address edge dryness and moisture profile instability across all machine scales. Its compact and versatile design makes it an ideal solution for targeted moisture application, whether the objective is to correct edge-related issues or to enhance the overall moisture profile. The demo enables verification of moisture penetration, cross-directional (CD) profile improvement, and seamless interaction with existing process conditions.

The demo trial allows producers to collect real-time production data and confirm that the moisturizer delivers the required profile accuracy and efficiency improvements before committing to a full-scale investment.

Key Evaluation Areas	
Edge dryness control	Effective reduction of edge dryness and related quality issues
CD uniformity	Significant improvement of cross-directional moisture uniformity
Process stability	More stable sheet moisture at target levels throughout the production run
Energy efficiency	Potential for energy reduction through optimised and precise moisture application
System integration	Verification of compatibility with current machine configuration and operating parameters

CASE STUDY: PAPER MILL



Brenpower Deployment Time < 3 days

Steam Trap Monitoring: 27 traps instrumented with batteryless wireless sensors

Steam Flowmeter: Clamp-on flowmeters at boiler outlet and each drying section

Boiler Efficiency Module: Stack temp, O₂ sensors, burner modulation integration

Condensate Return Analytics: 4 thermal sensors to flash tanks + return lines

Dashboard & Alerts: Smart Factory360 real-time monitoring with alert rules

KPI	Before	After (w/ Brenpower)
Boiler Efficiency (%)	74.2%	82.9%
Average Trap Failure Rate (%)	23%	< 5%
Steam Flow Variance in Dryers (%)	±26%	±4.4%
Condensate Recovery Rate (%)	43%	59%
Unplanned Line Stops (monthly avg.)	5.3	1.2
Annualized Savings Estimate	–	€287,000/year
ROI	–	4.3 months

Turning Energy into a Controlled Variable: Brenpower AI

Energy – particularly steam – remains one of the largest cost factors in paper production. Yet in many mills, it is still not fully transparent.

Brenpower AI addresses this challenge with a combination of wireless, battery-free sensors and AI-based analytics. Their systems monitor steam valves, steam flowmeters, steam traps, detect leakages and analyse energy flows across the plant in real time.

In one implementation, a mill that previously had no detailed visibility of its steam system was able to identify significant losses within weeks. Steam trap failures were detected far more quickly, energy consumption was reduced, and process stability in the drying section improved noticeably.

Perhaps most importantly, decisions could now be based on data rather than assumptions. Steam, once an invisible and largely unmanaged resource, became a measurable and controllable part of the production process.

What makes it unique is the non-invasive real-time measurement of mass flow, steam dryness and recommendations for action depending on the monitored instruments' performance. Predictive maintenance at the right valve, the right steam trap or flowmeter saves time and steam or condensate losses.

The installation of **Brenpower** sensors is scalable. For example, the steam sensor is always the same size independent of the pipe diameter where you want to measure.

To have a look at the easy-to-install sensors use this QR code:



Image 8: Long-lasting ropes for better and reliable runnability.

In a coating application, a mill struggling with short rope lifetimes tested an alternative design from Lanex. The result was a significant increase in service life, reducing the frequency of rope changes and improving overall machine availability.

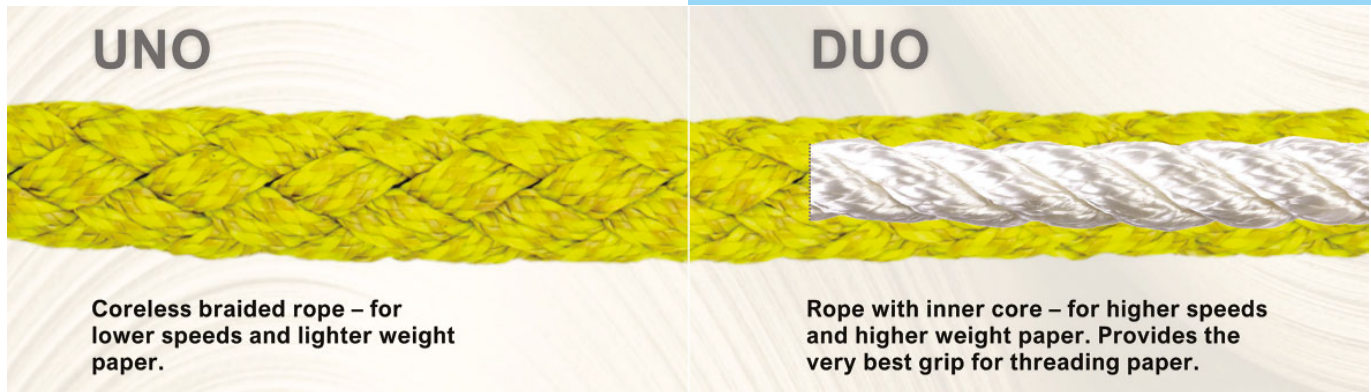
Such examples demonstrate that even seemingly minor components can have a substantial impact when optimised correctly.

In 2025 a board mill in Germany tested Lanex ropes successfully in the drying section. The customer has a production of >400.000 t/y with liner and board between 150 and 350 gsm. The ropes used were Superline DUO with core. During the test they were running without issue for about 10 weeks. The quality check done afterwards in the Lanex laboratory showed an expected remaining lifetime of 70%. That means under normal production conditions new ropes are able to last over 30 weeks.

Reliability in the Details: Lanex Paper Machine Ropes

Not all optimisation requires digital solutions. In many cases, improvements come from rethinking components that are often taken for granted.

Lanex focuses on high-performance paper machine ropes, a small but critical element in ensuring smooth operation. Rope failures can lead to unplanned stoppages, increased maintenance effort and safety risks.



Lanex R & D

The newest rope in the portfolio is Aramid Strandline. It provides high tensile resistance, excellent paper grip and is highly resistant to breakage.

It is designed with polyamide 6 (nylon 6) and has a rough surface while still easily spliced with the correct splicing technique. Its optimal working temperature is between 100 and 180°C. Each strand of rope is made of durable coated cords from which the rope is braided. The rope construction provides exceptional durability in the most demanding conditions.

Improving What Happens After the Process: Anaergia Technologies

Another often overlooked area is fine reject handling.

Anaergia Technologies provides solutions for improving the dewatering of fibre containing reject material, addressing both operational and cost-related challenges.

In one case, a mill producing recycled paper faced difficulties with insufficient dry content in its reject sludge, leading to complications in disposal. After installing a separation unit, the dry content increased significantly, simplifying handling and reducing disposal costs. At the same time, the system proved easy to maintain, an important factor for day-to-day operations.

Connecting the Dots: Where the Real Value Lies

Each of these technologies delivers clear benefits on its own. However, the real strength lies in their combination.

Process transparency from Pixact enables better control strategies. Tasowheel's systems translate this into stable product quality. **Brenpower** adds energy visibility, allowing targeted optimisation of utilities. Lanex improves reliability at the mechanical level, while Anaergia ensures efficiency even in downstream processes.

KPNB's role is to connect these elements in a way that makes sense for the individual mill—technically, economically and operationally.

Fiber Nexus: A Collaborative Model for Faster Solutions

With Fiber Nexus, this integrative approach has been taken one step further.

By working closely with **PETAX** - Papier Ingenieur Technik GmbH & Co. KG and **wolf heilmann GmbH**, KPNB ensures that customers benefit not only from technology, but from coordinated expertise and faster response times. Combining the three companies' networks of specialised suppliers enables more solutions to be delivered faster through improved communication and cooperation.

For mills, this means fewer interfaces, clearer communication and solutions that are developed with a full understanding of the process. Here, we highlight two examples of how this cooperation benefits paper producers by enabling KPNB and its partners to provide the best solutions more quickly.

Image 9: New ARAMID Strandline Rope from Lanex.



Image 10: Anaergia Technologies Separator FSP-A.

One of **PETAX**'s principals is Aikawa Fiber Technology Oy (AFT), supporting mills with the implementation and optimisation of advanced screening solutions.

Optimising Fibre Fractionation and Screening: AFT's Role in Stock Preparation

A critical lever for efficiency in paper production lies in fibre preparation - particularly in screening and fractionation processes. For mills aiming to improve efficiency, reduce operating costs and stabilise production, this area offers significant optimisation potential.

AFT is a recognised specialist in this field, focusing on high-performance screen baskets (Macroflow™), rotors and advanced screening systems. Their solutions are engineered to maximise separation efficiency while minimising energy consumption and fibre loss.

AFT's approach to rotor and screen basket design addresses one of the key operational challenges in screening: pulp thickening. By maintaining optimal flow conditions, AFT technology improves runnability, reduces energy demand and supports stable, high-capacity operation. Enhanced flow dynamics and controlled fibre interaction result in higher selectivity—particularly in demanding applications such as recycled fibre processing—leading to more efficient contaminant removal, reduced wear and more consistent downstream performance.

From an operational perspective, this translates into clear, measurable benefits:

- lower specific energy consumption per tonne
- improved runnability and process stability
- higher screening capacity and selectivity
- more efficient contaminant removal
- reduced wear and extended service intervals
- more consistent downstream performance

In combination with real-time process monitoring and control solutions, such as those provided by Pixact and Tasowheel, AFT enables mills not only to monitor fibre quality, but to actively improve it at the source.

One of wolf heilmann's principals is Klass Filter GmbH. Its unique new product, the Jet Wing Liquid offers a novel filter concept to the paper industry.

This filter enables the elimination from the water loop of

- all particles bigger than 99µm resp. 59µm,
- as well as all particles heavier than water,
- at a cost of 60 W/m³ to 140 W/m³,
- significantly reducing water consumption through use of smaller nozzles (up to 90% less water as seen in practical operation) with no maintenance,
- as it works with a negative-pressure pulse every 0.03 seconds
- completely wear-free (the first units used in sewer flushing were installed 30 years ago and still working perfectly).

It turns water into **Klass Filtrate**, which is different from clear filtrate. The Jet Wing Liquid does not necessarily turn the water into clear filtrate, as some very small and soft particles may still be present—but these do not adversely affect the papermaking process.

50 to 75 m³ of Klass Filtrate can be generated per hour by a single unit, depending on the quality of the water to be treated.

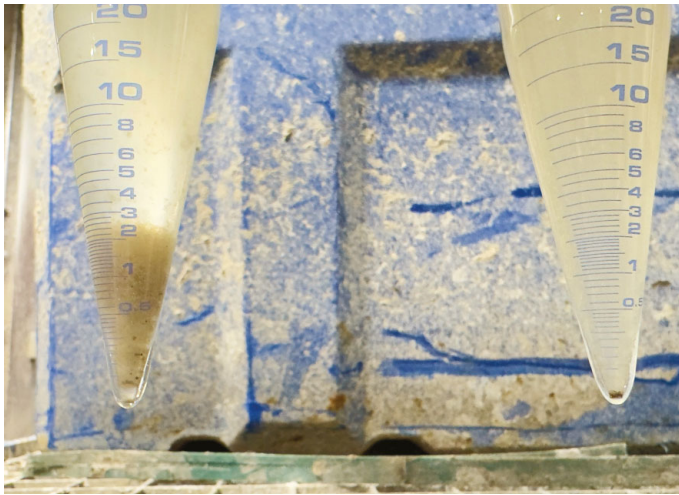
The payback time of an installation ranges typically between 3 and 18 months, depending on the nature of the application.



Image 11: The latest development, the GHC2 rotor, has demonstrated energy savings of more than 30% compared with conventional designs.



Image 12: Partial view of the Jet Wing Liquid from Klass Filter with inlet on the top left, accept at the bottom center and reject at the bottom right.



Result of turning clear filtrate into *Klass Filtrate*:

Left: entrance to the filter, a lot of particles bigger than 100µm can be seen – those clogging the nozzles of spray bars or lubricating units. As well as many particles with higher specific weight than water.

Right: In the *Klass Filtrate* there are no harmful particles.



Left: ultra clear filtrate at the entrance of the Jet Wing Liquid. It appears to be perfect water, but it can only be used for the pulper, with the excess sent to the effluent system, as too many particles remain and can clog nozzles. (but not found in this sample)

Right: *Klass Filtrate* with reduced turbidity, and no harmful particles. COD is significantly reduced, as the turbidity was caused by fibres, which now stay in the paper machine loop. Only too short fibres are now going to the water treatment plant.



Left: clear filtrate from water after the water treatment plant. Too many heavy and big particles, which clog nozzles within 2 to 24 hours. And too many fibres, which clog conventional filters in 30 to 120 minutes.

Right: perfect water for nozzles of diameter 125 µm and above, as maximum particle size is well below 60µm, and all hard and heavy particles have been eliminated. Spray bars work for 6+ months without clogging and wearing the nozzles.

A Different Approach to Market Access

For international suppliers, entering the DACH market is often challenging. Expectations are high, and trust plays a central role.

KPNB provides a structured entry point, combining technical understanding with direct access to decision-makers. Through continuous communication, industry presence and a well-established network, new technologies can be introduced in a way that aligns with real customer needs.

This benefits both sides: suppliers gain a reliable market partner, while mills gain access to innovations that are already filtered, evaluated and matched to their requirements.

Conclusion: Practical Innovation for a Demanding Industry

The pulp and paper industry does not lack innovation. What it requires is the ability to apply it effectively.

By focusing on practical solutions, measurable results and strong partnerships, KPNB has developed a model that helps mills address today's challenges without unnecessary complexity.

Whether it is making energy consumption transparent, improving process stability, enhancing product quality or reducing operational risks, the principle remains the same:

Find the right partners, connect the right technologies—and focus on what truly delivers value in the mill.

In a time where every percentage point of efficiency matters, this approach is not just beneficial. It is essential.