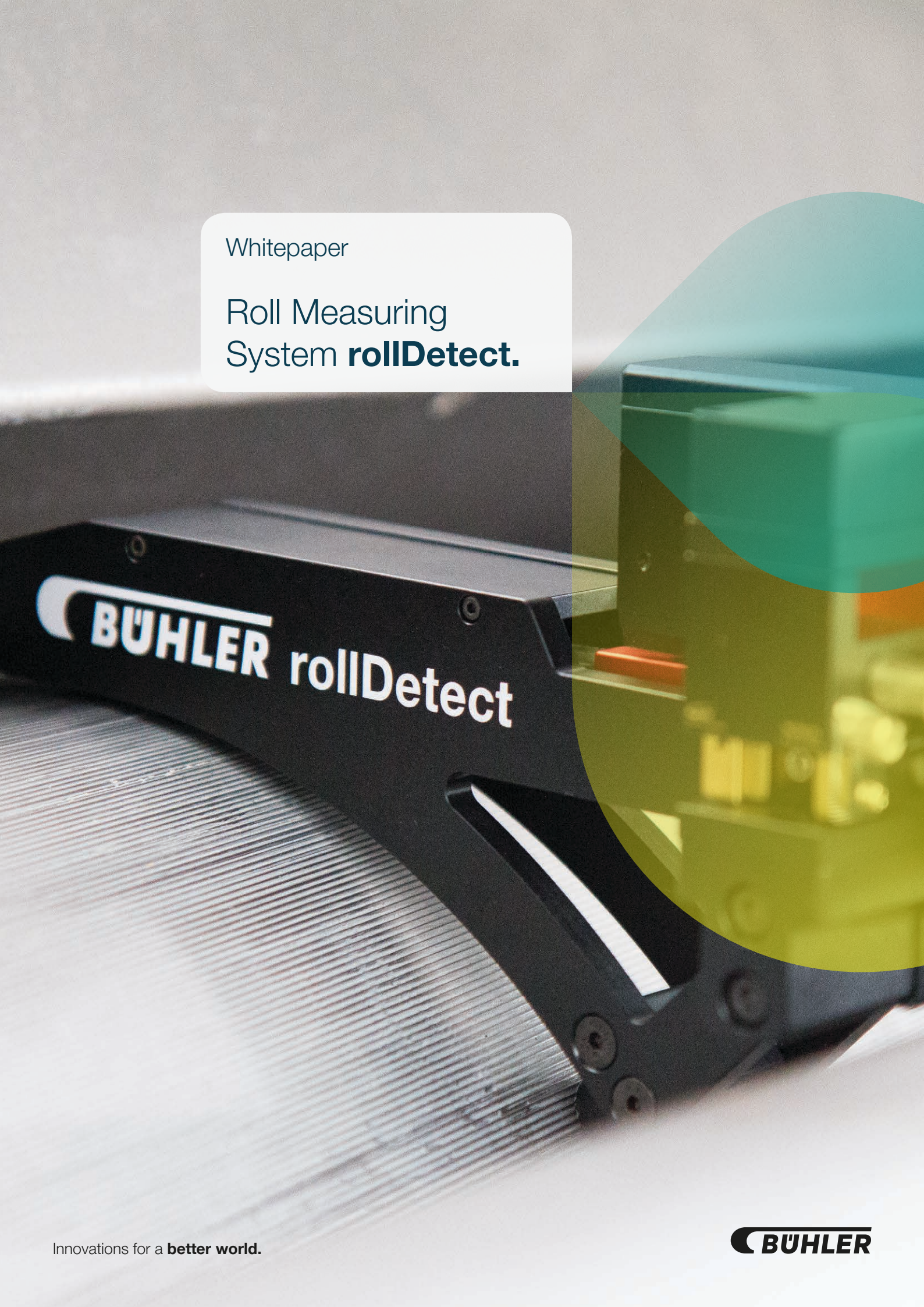
Whitepaper

Roll Measuring System **rollDetect.**



Innovations for a **better world.**

BÜHLER

Taking the guesswork out of roller maintenance. **How Bühler's rollDetect service reduces cost and improves yields.**

Worn-out rollers cost plants in the food, feed and brewing industries thousands of dollars a month in lost yields, higher energy costs and lower quality product. rollDetect accurately measures wear and enables plant operators to plan the optimum maintenance plan.

When is the right time to change rollers? It's a crucial question for any plant operator in the food, feed or brewing industry, and getting the answer right can make a significant difference to the plant's productivity and profitability. Wear — and — tear on rollers reduces yield and increases operating costs. Traditional methods of assessing wear are time consuming or subjective. rollDetect provides accurate measurements for fluted and smooth rollers. With the full service, plant operators can calculate the cost savings that can be achieved by replacing rollers at exactly the right time.

Flour milling is an ancient yet complex craft. Our food value chains rely as much today as they have for millennia on the miller's ability to turn grain into a product that is healthy, nutritious, attractive, and safe for the consumer.

The grinding rollers are at the heart of the operation. Spinning at high speed, they must work in perfect harmony, accurately separating the bran from the endosperm, passage after passage, producing ever finer flour. Achieving clean sizing is a fine art.

It is not only the flour mill that relies on this process. It also plays a key role in the brewing and feed industries. In grist mills like the Maltomat III MDBA and in feed mills like the multi-stage grinding DFZL, grinding rollers are equally central to operations.

However, the grinding process subjects rollers to severe stress – stress they cannot withstand indefinitely. Constant use wears down the finely cut contours of fluted rollers and decreases the required level of roughness on smooth rollers.

"When they are properly serviced, the rollers' cutting angles act like a fillet knife. In a flour mill, that is how they open up the wheat kernel. Through each break the angles change, allowing a scraping action to accurately peel off the endosperm from the bran," says Bill Ritchie, Technical Sales and Service, North America. "If the cutting angle begins to wear, it will not cut correctly and will inhibit the miller's ability to set the rollers properly. The process will change from a cutting action to a crushing action. This not only requires more energy; it also fails to deliver the right kind of granular product."
"This is significant in terms of the economics involved but also a question of sustainability," says Roman Inauen, Customer Service Sales Support, Milling Solutions, Bühler Switzerland. "If you can maintain a maximum yield, that means there is less waste of precious resources, like water, and more flour that is made into bread to feed people. The same principle applies for the brewing and feed plants. Keeping rollers in top condition means less waste and more profitability."

> The consequences are significant for the flour miller. In the case of fluted rollers, the yield of pure flour extracted during sifting can drop by two, four or even six percent if the rollers are blunt. Both throughput and yield decline. An average 400t flour mill experiencing a drop in yield of only **0.1 percent** will incur loss of revenue of approximately **12,000 USD** a month (based on US market prices). Energy consumption may rise by as much as 50 percent, while moisture content declines and the quality of the end product suffers.

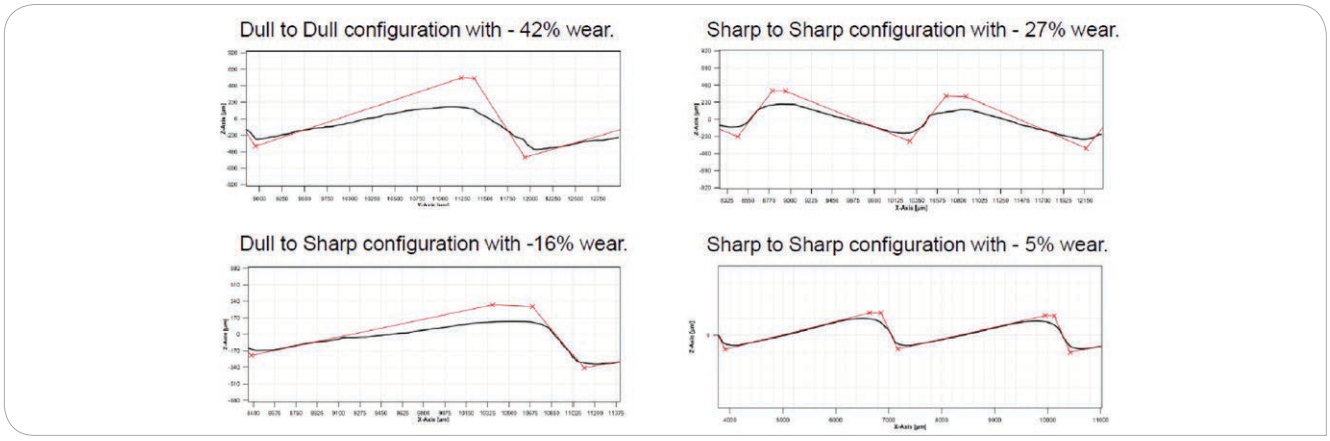


Figure 1.
rollDetect's analysis of worn out fluted rollers

Too costly for guesswork

Worn out rollers are costly and compromise product quality. To maintain the profitability of a milling plant, timely replacement is essential. How can plant operators evaluate wear and determine the right moment for an exchange of rollers?

Plants deploy several strategies and techniques. However, none of these is fully adequate. Some resort to generic maintenance schedules or a set volume of material processed as a marker for impending replacement. Some exchange the rollers frequently, even when they are still in working order. Some inspect rollers by scratching the surface with a fingernail without seeing if the fluting profile is intact. Others try to determine the right moment of exchange by sampling the granulation of sifted product Increased power consumption may give clues, but it does not provide any information on which passage and roller is responsible for decreased efficiency Moisture detection and ash curve checks may provide more accurate results but require lab tests. Some of these methods are highly subjective, others deliver objective data but lack detailed and complete analysis resulting in ill-informed decisions with a detrimental effect to the bottom line and quality.

Knowing rather than guessing

Bühler has more than 160 years of experience in the milling industry and roller technology. As technologists we understand the commercial context our customers operate in. When rollDetect was launched it revolutionized roller inspection and smart exchange planning. Today rollDetect is in operation at more than 90 Bühler workshops around the world improving operators' bottom line.

"Ten years ago, before the introduction of rollDetect, we really felt the pain of our customers experiencing a huge drop in throughput and yields. With microscopic equipment we inspected third party rollers at one of our workshops to get a better understanding of the situation," says Ritchie. "This sparked the development of rollDetect."

Initially, the measuring device was used to inspect refluted rollers before they left the Bühler workshops. Today, the device can be used in the workshop or out in the field, and the same device can be used for smooth or fluted rollers.

"As technologists we endeavor to make our customers more profitable and maintain a high product quality. So, the service soon developed into something more exciting," says Ritchie. In 2019, he visited 240 milling plants in the US alone to better understand customers'

needs. Ten years on from its launch and with more than 90 rollDetect units in service worldwide, Bühler provides the tools, expertise and experience to precisely determine the right moment for a refit.

Truly cutting edge – the rollDetect service package

The success of rollDetect rests on the unique precision of the rollDetect device in conjunction with analytical software – available in 8 languages (English, German, Japanese, Spanish, Italian, Portuguese, Vietnamese and Russian) – and the expertise of Bühler's experienced process engineers, who carry out the measurements and interpret the data on-site at the customer's plant, whether it is a flour mill, a feed mill or a brewing machine.
"Our deep understanding of market conditions and the specific needs of individual plants, combined with our technological expertise, together form the rollDetect service package, providing the best analysis and detailed plans of action," says Inauen. "Over the past ten years we have been able to demonstrate that customer benefit significantly increases with the number of measurements a Bühler consultant has performed."

This is the main reason why rollDetect is offered as a service package rather than sold as a hardware and software bundle. It is also important to consider that measurement technologies continue to evolve at a rapid pace. The rollDetect service package allows customers to benefit from the latest technological developments in this area. "At Bühler we continuously upgrade the technical components of the measuring device," says Ritchie.

The rollDetect measuring device

The innovative device is fitted with a precision contour red tracer stylus for fluted rollers or, for smooth rollers, a roughness blue tracer stylus equipped with a fine diamond tip. "We can actually assess all rollers at a plant. That provides us with the full picture rather than fragmentary piecemeal information," says Inauen. In addition, it features a positioner, the measuring system and a signal converter which is connected to a PC. The system is bundled with specifically designed software, developed and continuously optimized by Bühler for accurate analysis and wear prediction. The rollDetect measuring device is portable and quickly installed by Bühler's process engineers. The entire measuring procedure can be undertaken with minimal interruption to the operation.

Figure No. 2
The rollDetect measuring device: Designed for precision measurement

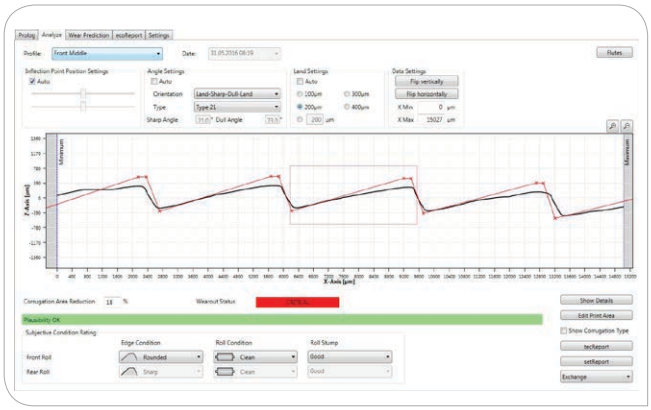


Figure No. 3
The report includes all essential information in an easy to read format

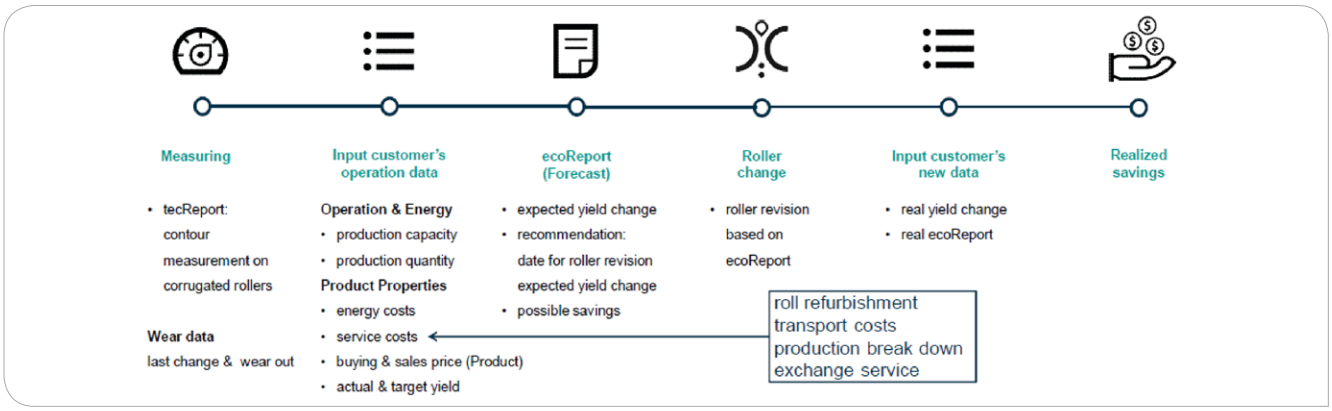


Figure No. 4
The process flow for sustained savings

Reports – answering the two most important questions

Are the rollers in working order and what is the absolute wear on the rollers? Comprehensive reports containing conclusive data and graphical representations equip operators with the information they need for objective decision making. “It’s a holistic approach, taking the entire process a step further,” says Ritchie. “The rollDetect software provides information on critical business figures and helps determine the best course of action.”

There are four types of report:

1. **tecReport** for fluted and smooth rollers, available in field mode
2. **ecoReport** for fluted rollers, available in field mode
3. **rollReport Summary**, available in field mode
4. **rollReport for reconditioned fluted rollers**, available in workshop mode

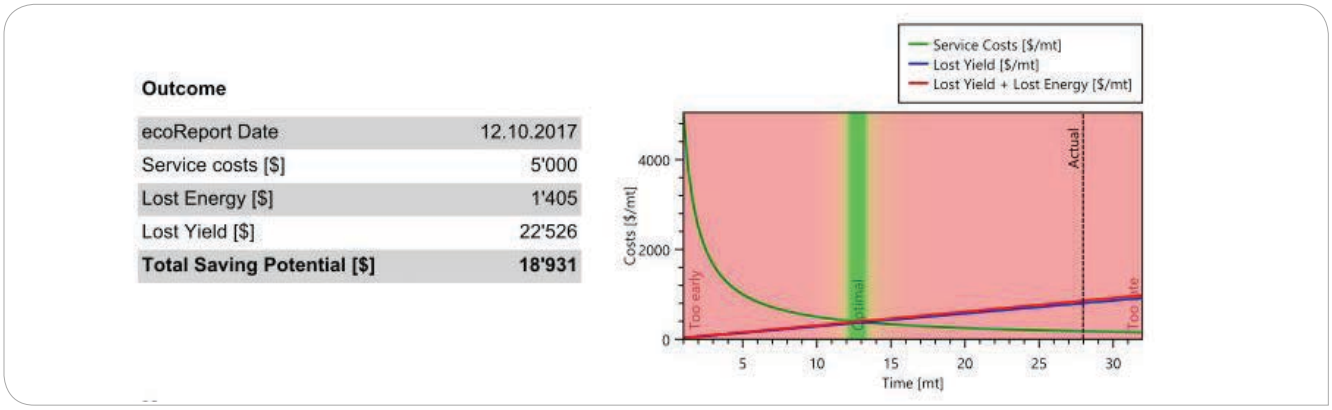


Figure No. 5
The roller exchange sweet spot

tecReports for fluted and smooth rollers

Generated on-site, the tecReport features detailed graphic representations of actual and target corrugation profiles. For smooth rollers, a graph displays roughness measurements. Roughness values are presented in Ra (average roughness) adhering to DIN EN ISO 4287. A user-friendly traffic light system instantly answers the most pressing questions: Are the rollers in working order and what is the absolute wear on the rollers? Based on the measured values of the surface and corrugation edge condition, initial consultative advice can already be given on-site, keeping downtime to an absolute minimum. Customers are provided with the complete findings in the report.

ecoReport for fluted rollers

The ecoReport provides customers with information on the economically optimal timing for examining rollers and a recommended date for the next roller change. The measurement values are combined with customer-specific operational data. The results form the basis for a profitability analysis, showing detailed information about the customer's service costs, energy loss due to non-optimal maintenance as well as the resulting loss in yield. The report forecasts data on the expected yield change, recommends a date for a roller revision and calculates the saving potential. With this holistic approach, customers benefit from Bühler's consulting expertise, resulting in tangible savings.

rollReport Summary for fluted rollers

The report provides customers with an overview of the results of tecReports. This encompasses values on the wear status of each roller ("OK / WATCH / CRITICAL") as well as recommendations for action ("GOOD" or "EXCHANGE").

rollReport for reconditioned fluted rollers

Rollers reconditioned by Bühler are inspected at our workshops before they are shipped to customers. A rollReport provides customers with data on an individual roller's condition, giving peace of mind.

Key takeaways

1. Worn out rollers are costly — The correct timing of roller exchange saves cost and maintains quality at the highest standards.
2. Many measuring techniques are subjective or provide incomplete and inconclusive data — The roller exchange often takes place too early or too late.
3. rollDetect provides accurate empirical data on the condition of rollers — It is a proven system designed to provide tangible cost benefits.
4. Designed for fluted and smooth rollers, workshops and the field — Only Bühler's measuring device is so versatile.
5. A holistic approach for best performance — Bühler's rollDetect service goes beyond measuring individual rollers, providing a forecast of optimal exchange timings and predicted cost savings.

Roman Inauen

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Roman Inauen has been with Bühler for 28 years. In his current position he provides worldwide sales support for customer service (CS) in Milling Solutions (MS). He is responsible as product manager for rollDetect. As part of this role he trains staff in the field, including customer sales support and on-site measurement training

Bill Ritchie

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Bill Ritchie has been at Bühler in North America for 8 years working in technical sales and service. In this time, he has helped build up the customer service businesses across the USA, Canada, and the Caribbean. This has also included building a roll reconditioning center in Minneapolis and promoting IOT solutions for the flour, specialty and oil milling industry to help millers optimize production.

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