Metris
ANDRITZ Digital Solutions

GRINDING CONTROL

HAMMER MILL CONTROL SOLUTIONS FOR THE PERFECT GRIND OF VIRTUALLY ANY MATERIAL

ANDRITZ

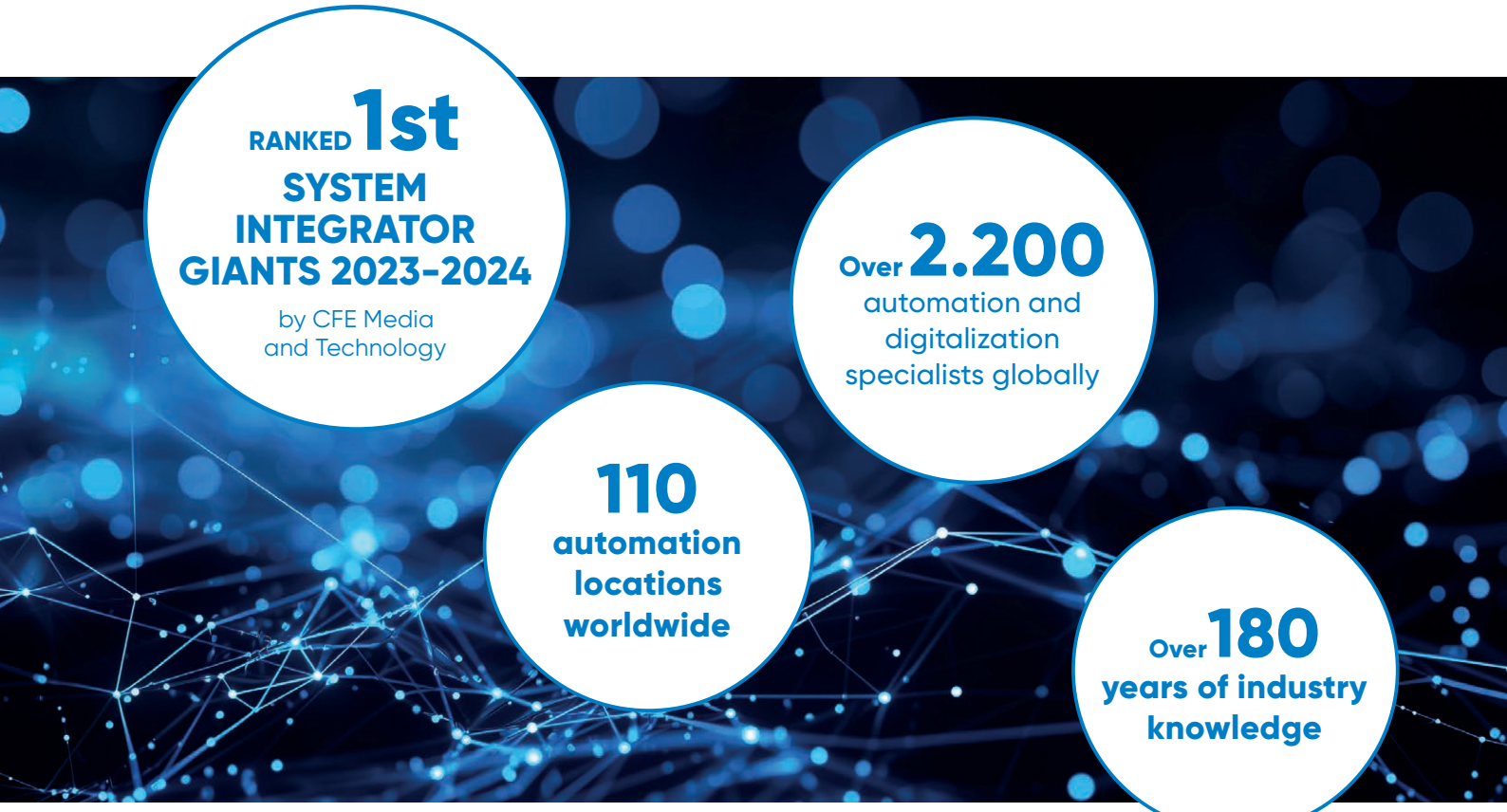
NEVER STAND STILL

At ANDRITZ, we understand the challenges the feed and biofuel industry faces today. With volatile raw material prices, emerging outbreaks, and a competitive marketplace, the need for innovative solutions has never been greater. Our Automation & Digitalization solutions, powered by the Metris Digital Platform, are designed to upgrade your operations, ensuring profitability, reducing total cost of ownership, and enhancing operational excellence.

Leveraging 40 years of cross-sector success, our platform blends human and digital intelligence to enhance processing efficiency and support growth, while delivering 7 - 16% throughput increases.

Our solutions encompass an evolving, vendor-neutral solution supported by state-of-the-art automation and digitalization technology.

ANDRITZ supports you every step of the way on your digitalization journey, ensuring your plant and your business **NEVER STAND STILL.**



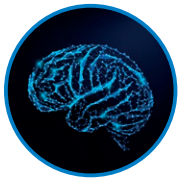
FOUR PILLARS OF SUCCESS

Through our global industry-specific expertise and deep understanding of the challenges our customers face, we deliver automation and digitalization solutions based on four key pillars.

AUTOMATION
The 'Muscle'

Achieve peak performance over the entire lifetime of your lines

The automation suite encompasses a broad spectrum of control solutions ranging from basic to fully automated systems, including production management, real-time plant simulation, condition monitoring, process optimization, and life cycle management.
These components maximize plant throughput, simplify maintenance, and optimize resource use.



DIGITALIZATION
The 'Brain'

Maximize your plant's potential while minimizing investment risk

The digitalization suite offers a holistic digital infrastructure for process optimization, asset management, operator training and knowledge management, ensuring a turnkey approach to feed and biofuel processing operations.
Our digitalization platform transforms operational data into robust, actionable analytics, maximizing your plant's potential while minimizing investment risk.

DEEP INDUSTRY EXPERTISE
The 'Heart'

Over 180 years of industry expertise and a global footprint ensure our solutions are adaptable and regionally attuned.
We preconfigure solutions based on our deep process knowledge, giving you immediate access to our know-how, our portfolio, and our service infrastructure all in one place.

AUTONOMOUS OPERATIONS
The 'Vision'

We strongly believe that the journey to autonomous operations is paved with bold steps by those who embrace every facet of automation and digitalization, turning challenges into opportunities for growth.
By taking that initial leap, you can unlock a world of possibilities. We can help you achieve a fully autonomous feed plant by 2027.

GRINDING CONTROL

This document is intended as a comprehensive introduction to Andritz's automation and control solutions for hammer mill lines. It provides essential insights into production control and automation and the extensive capabilities of Andritz's solutions. The emphasis is on the practical features of these solutions in various scenarios.

Grinding Control System

User-friendly solution designed to facilitate the control and automation of a hammer mill line. It seamlessly integrates state-of-the-art machinery and complex processes with an intuitive, easy-to-use interface, simplifying operations and enhancing planning and decision-making capabilities.

Market-proven automated control solutions trusted worldwide

OVER 100 GRINDING CONTROL SYSTEMS INSTALLED GLOBALLY

CUSTOMERS IN OVER 30 COUNTRIES, enhancing their operational efficiency and reliability with us

- **Unmatched Expertise:** In-depth knowledge of process automation.
- **Tested Excellence:** High-quality, industry proven solutions.
- **Plug & Play Preconfigured Solutions:** Delivering adaptable solutions for your exact needs.
- **Global Support Structure:** Prompt and effective assistance for any challenges.
- **Secure Compliance:** Upholding industry cybersecurity standards.

Effortlessly integrates into existing systems

Easy-to-use, intuitive interface

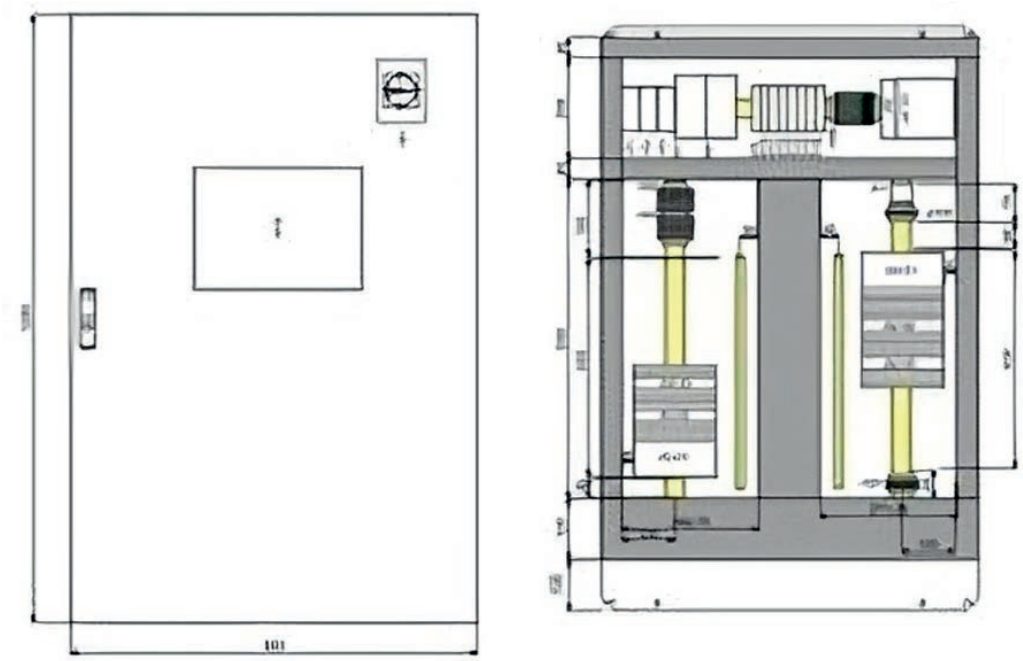
Simplifies operations

Enhances planning and decision-making capabilities

5

Control Options

Grinding Control System is available through the Panel System, which is a cost-effective choice that provides an optimal balance between performance and expenditure. It includes a user interface that displays relevant information, enabling direct monitoring and control of manufacturing operations. It also supports add-ons, offering flexibility to adapt to evolving needs. The system is designed with a focus on operational success, offering control, flexibility and growth potential.



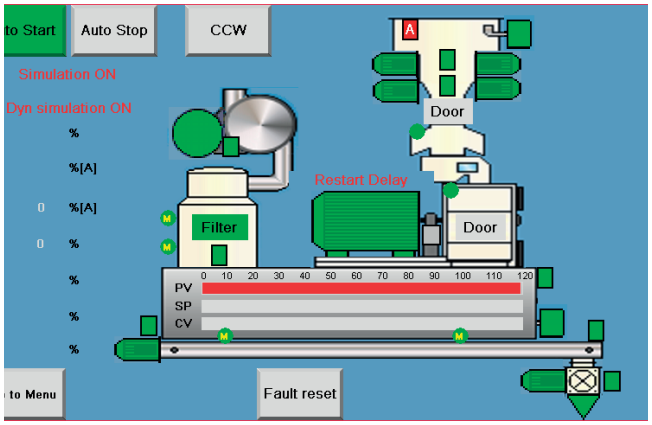
Panel system

Panel System

Panel System is a standalone, cost-effective solution that is installed in the field near the machines. The system includes a PLC, a panel PC and this approach reduces costs and complexity. It doesn't offer remote control, but instead prioritizes direct, localized control. The system is adaptable, allowing for future additions. It's designed for smaller operations, providing real-time control and data collection from process functions.

SYSTEM DESCRIPTION

Panel System consists of a wall mounted panel with a 12" touchscreen computer and a PLC with input and outputs. It is Ethernet-based and has a 5-port switch where all network units are connected.



FEATURES

- **Interactive Display:** This feature offers a graphical representation of your setup. It includes a control section for line operation and an alarm bar. It allows access to pop-ups for adjustments via touchscreen inputs. The display aligns with your system configuration, mirroring the actual installation managed by the Panel System.
- **Function-Based Control System:** The system utilizes a function block-based approach, enhancing process visibility and allowing more granular control. It supports various functions and allows simulations for testing the functionality of the program.
- **Interactive Function Pop-ups:** Clickable functions open configurable pop-ups, providing detailed information and allowing parameter adjustments. Color coding offers immediate visual feedback, enhancing user control and system understanding.
- **Trend Displays:** The system features trend displays, showing parameter development over time. This powerful tool aids in tuning PID controllers and analyzing process issues, enabling efficient problem-solving and system optimization.
- **Historic Alarm List:** Tracks all past alarms, aiding in process analysis and understanding system behavior.
- **Analytics Indicator:** Showcases key metrics such as work hours, production quantity, and software version.

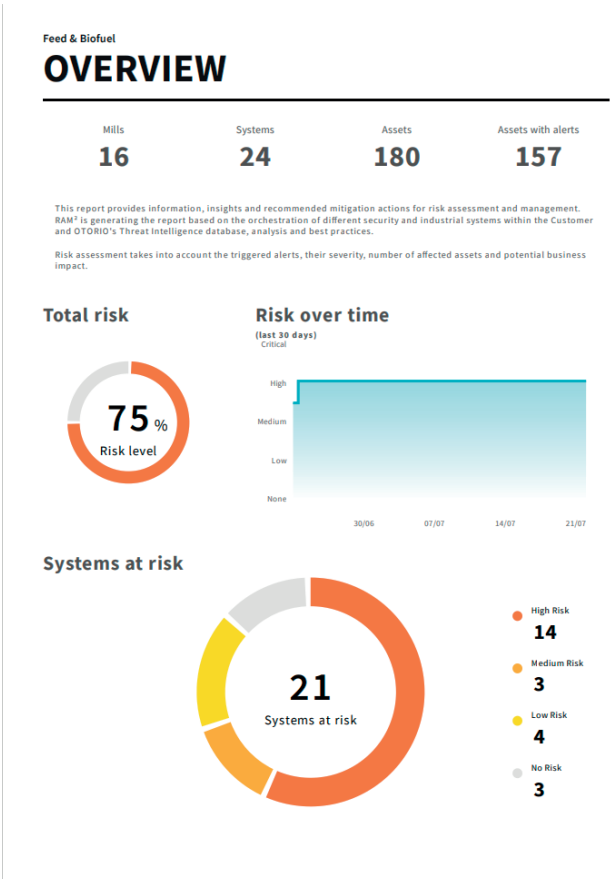
Cybersecurity Offerings

THE CYBERSECURITY PROBLEM

The digital revolution has boosted operational efficiency but also heightened cyber-attack risks. Such attacks, now common across sectors including feed and biofuel, pose significant threats.

IMPACT OF CYBERATTACKS

Cyberattacks are highly destructive. These attacks disrupt supply chains, halt production, and affect operations, leading to significant losses. On average, a cyber-attack causes a 5-day production halt, costing approximately $4.47 million.



OUR SOLUTION

ANDRITZ helps its global customers minimize digital and cyber risks through its partnership with leading OT security provider OTORIO. ANDRITZ provides combined, advanced cybersecurity and automation options integrated into its systems, safeguarding operations against cyber threats and disruptions, ensuring smooth, uninterrupted production.

STANDARD PLATFORM - OTORIO spOT™

ANDRITZ utilizes spOT™, a unique technology developed by its OT security partner OTORIO. spOT™ is an integral part of the machine delivery and quality procedures, supporting system hardening. By checking the full machine against the relevant IEC62443 / NIST / NERC standards or additional standards required by customers, spOT™ creates a cyber security "machine fingerprint" and automatically generates machine-specific IEC compliance letters.

FEATURES

- ANDRITZ conducts factory acceptance tests for all equipment. With Otorio spOT™ integration, these processes become less time-consuming and more cost-effective, ensuring that products meet all required standards before shipment.
- All equipment delivered by ANDRITZ, including Windows PCs and servers, is IEC62443 compliant helping organizations understand and mitigate system risks.
- Comprehensive complaint reports are provided for all Windows PCs and servers, keeping you informed about your system's security state.

OPTIONAL FEATURES:

- **Updating the equipment with new patches:** Regular updates are crucial for maintaining the security and functionality of your equipment. They help to fix vulnerabilities, improve performance, and add new features.
- **Implementing additional hardening, per spOT's security overview and compliance reports:** dening your systems can significantly enhance your security posture. It helps to reduce system vulnerabilities and protect against potential threats.

ADDITIONAL OPTION - OTORIO RAM²

Otorio RAM² is a distinct, advanced OT cybersecurity platform for organizations looking to further invest in their cybersecurity governance. It integrates seamlessly with existing systems, serving as an overlay or standalone solution for industrial control systems (ICS) and cyber-physical systems (CPS). Please note that the platform requires a separate acquisition by the customer.

FEATURES

Unparalleled Visibility: RAM² orchestrates data from cross-domain sources, providing a consolidated view of your entire operational network. This feature makes monitoring and risk management more efficient and proactive.

- **Correlated insights:** RAM² correlates data from various sources, reducing noise and providing actionable "insights". This enhances focus and effectiveness in threat response.
- **Non-intrusive attack simulations:** With the help of cyber digital twin technology, RAM² forms a virtual duplicate of your OT network. This allows security teams to simulate potential breaches and attacks, helping to foresee and prepare for possible threat paths.
- **Integrated overlay:** RAM² can be used as an overlay or a standalone OT security solution, maximizing ROI from your existing operational security stack. This feature prevents downtime and financial losses.
- **Powerful noise reduction:** RAM² reduces unimportant and irrelevant alerts by up to 80%, eliminating alert fatigue and making sure that genuine threats are not obscured.

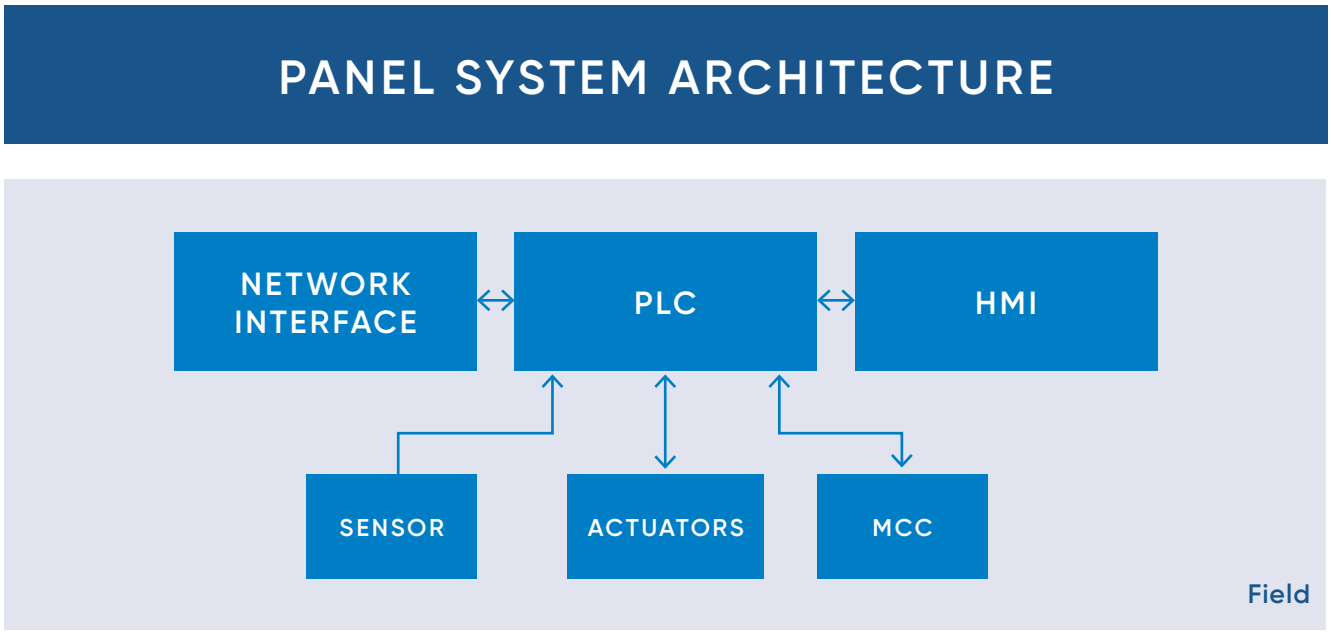
WHAT IS THE RIGHT CHOICE FOR YOU?

- **Otorio spOT:** for a strong security foundation in your operation. Otorio spOT ensures essential protection, provides on-demand reports, and is a cost-effective solution. Additional, bonus features can be acquired if you wish to further strengthen your operation's security.

- **Otorio RAM²:** if you wish to create an enterprise-wide security strategy, have preexisting cybersecurity options that can be integrated, and desire total and comprehensive control and monitoring of your cybersecurity., Otorio RAM² is ideal. It integrates with existing systems, maximizing return on investment.

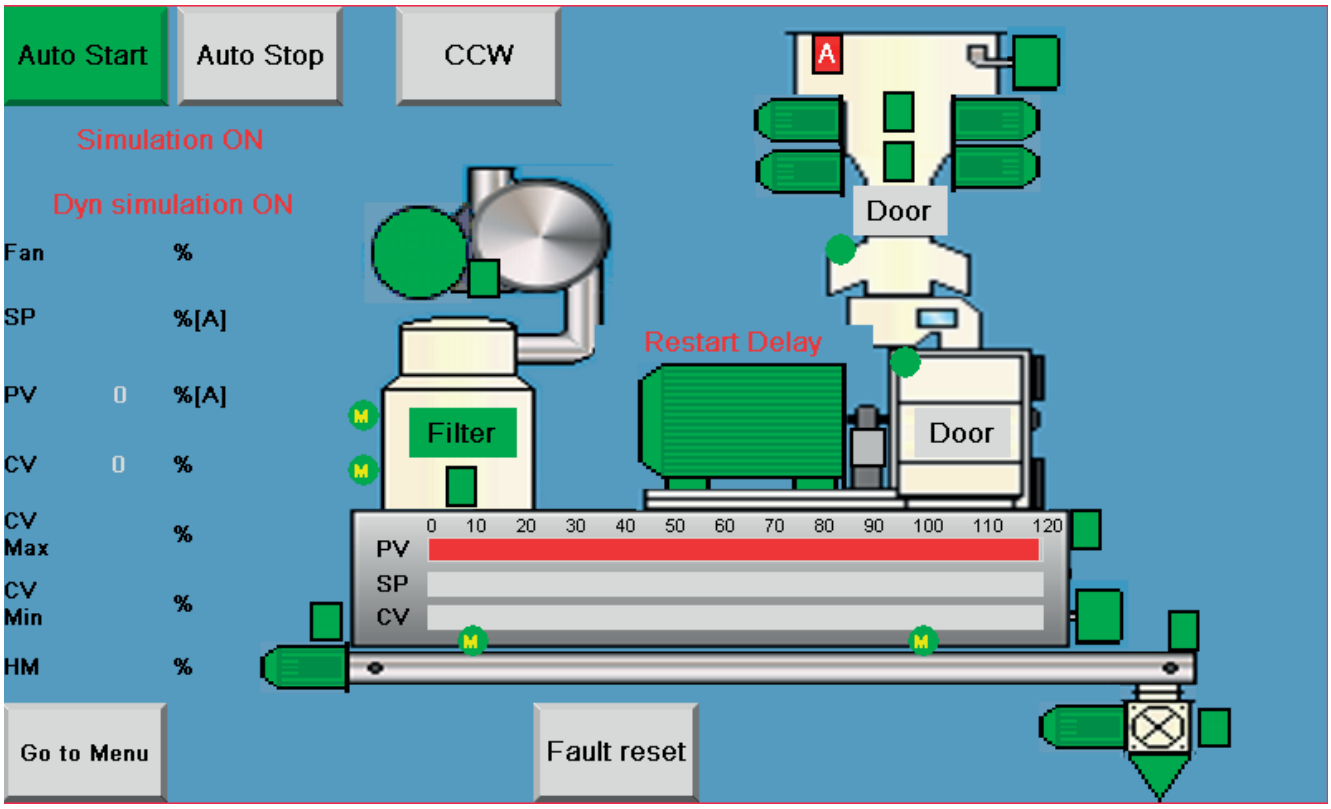
Remember, the right choice is the one that best fits your specific needs and objectives, and we're here to help you make that choice.

Control System Architecture



Panel System Architecture

Grinding Controls



Example of Main graphic overview

MAIN SCREEN FEATURES

The **graphical overview** is the main screen for setting desired set points and starting/stopping the machine automatically. It displays the entire installation and includes fields for adjusting set points and displaying process values.

Color Indicators:

- Black: Changeable set point
- Gray: Read-only value (e.g., monitored data)
- Pink: Control value (e.g., feed screw speed)
- Green: Process value (e.g., motor ampere)
- Yellow: Low limit of a process value
- Red: High limit of a process value
- Motors: Gray (Stopped), Green (Running), Blinking (Error)
- Switches: Green (OK), Red (Prevent operation), Blinking (Alarm)

BUTTONS

- **Auto start & Auto stop:** When clicking Auto Start; all steps initiate automatically. Clicking Auto Stop will reverse this sequence. Auto start and auto stop buttons will put all equipment to automatic mode.
- **CV Max and CV Min:** Configures the maximum and minimum speed of the feed screw.
- **SP and PV:** The SP button allows the adjustment of the percentage of the main motor's nominal current for the PID to regulate, while the PV displays both the actual amperage in percentage of the nominal current and the real-time amperage.

Grinding Process Units

The following section describes the grinding process units, their components, and their role in controlling and monitoring the process, including labeled parts of the P&ID.

LIVE BIN, TYPE VB

The live bin VB is used as a pre-bin for grinding. Its ability to homogenize grain/meal mixtures ensures that hammer mill screens are kept clean during subsequent grinding and that the load on the hammer mill remains constant.

LIVE BIN CONTROL:

- **Internal screw with asynchronous gear motor:** Rotates internal screw forward at nominal speed to prevent the content mass from settling and creating blockages in the outlet. Homogenizes grain/meal. Used when grinding.
- **Single coil pilot operated pneumatic cylinder with two position sensors:** Moves the slide gate between the open and closed position to adjust product flow and empty the batch bin. Position sensors indicate actual open/closed status.
- **Level switches:** Indicates the empty/full level of the bin to prevent overflows, ensure consistent material flow into the grinder, and reduce unplanned downtime.

DOSING MODULE

The hammer mill is a critical component in most feed manufacturing operations. Its performance and reliability can only be optimized if it receives a steady, consistent, uniform supply of material across the full intake area of the hammer mill. It also requires an automatically controlled drive system that can adjust the speed of the feeder for quick and accurate feed rate control.

DOSING CONTROL:

- **Pocket/Screw Feeder:** A variable speed drive controls the speed of the pocket feeder (or screw feeder) according to the desired amperage load set point of the main motor. This ensures that the feeder does not supply more material to the hammer mill than the main motor can tolerate.
- **Level switches:** Indicates the empty/full level of the bin to prevent overflows, ensure consistent material flow into the grinder, and reduce unplanned downtime.
- **Low-level feeder speed limit:** Prevents the feeder from running at a speed below the setpoint and ensuring the material keeps moving, which avoids blockages in the hammer mill.
- **Overload switch:** A switch at the end of the feed screw detects material overflow, preventing blockages and ensuring smooth operation.
- **Automatic start of feed screw:** Automatically starts the feeder when the prebin is refilled, reducing downtime and manual interventions during refilling.
- **Adjustable alarm delays:** Delays for alarms related to low level switches, feeders, and overflow sensors prevent false alarms from temporary conditions, ensuring only sustained issues trigger alarms or emergency stops.

Feeder configuration screen

SEPARATOR MODULE

A separator removes stones, tramp metal, and dense materials from material entering a hammer mill. The separation of materials takes place as an air stream carries material through the Separator. As the material is conveyed over an adjustable opening, gravity pulls the heavier materials into a trap. Lighter materials convey past the opening and into the hammer mill below. An internal mechanical magnet is present to remove ferrous tramp metal from the product stream.

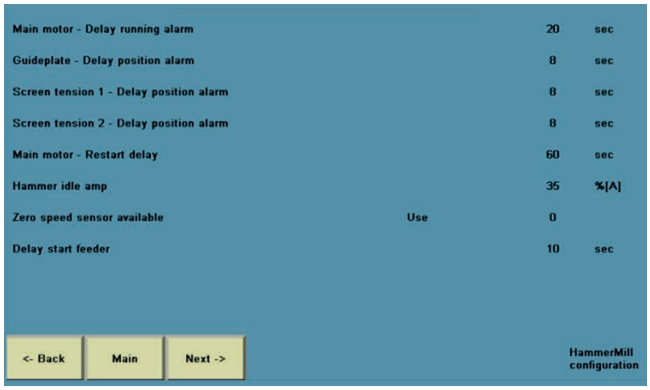
SEPARATION CONTROL COMPONENTS:

1. **Deflector Plate & Magnet:** A pneumatic air cylinder adjusts the airflow plate and magnet to the correct position, ensuring that foreign objects are captured and do not cause damage to the hammer mill components.
2. **Separator door switch:** Creates an alarm if separator door is not closed.
3. **Guide plate position sensor:** The system monitors the plate position and triggers an alarm if a fault is detected. To prevent false alarms caused by temporary conditions, the alarm delay can be adjusted.

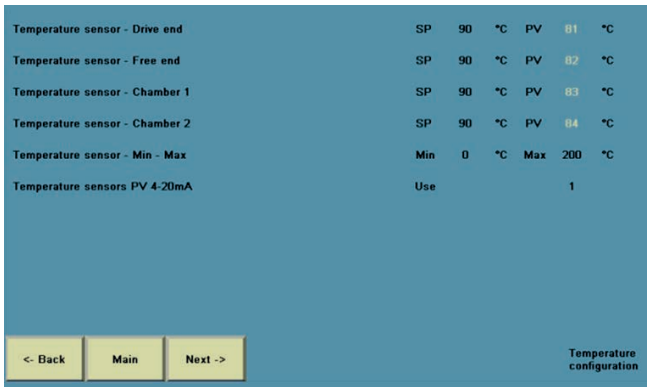
Separator configuration screen

GRINDING MODULE

The hammer mill chamber has a rotor equipped with hammers that grind the material to the right particle size. To distribute wear across both corners of the hammers, the rotor can rotate in both directions. The chamber has a constant air flow from the inlet in the top, to the outlet in the bottom. A diverter in the top diverts the product to match the direction of the rotor and evacuates it through the surrounding screens when the product has been ground to the desired particle size.



Hammer Mill General Configuration Screen



Temperature Configuration Screen

- **Asynchronous motor:** main hammer mill motor, drives the hammers that beat the material. Switches rotation at service interval/efficiency deviancy.
- **Motor restart delay:** The Motor restart delay is set to avoid overuse and overheating during short stops.
- **Guide plate:** The guide plate controls the direction of the material transported across the rotor. In case the direction of rotation changes, the guide plate position in the inlet will change automatically by the means of a pneumatic cylinder.
- **Power consumption values:** Continuously measures the hammer mill's main motor consumption to control feeding/dosing. It indicates hammer efficiency, prevents blocking, and protects the equipment from overload. An idle current limit can be set to prevent the main motor from running below a set value which could cause blockages.
- **High load alarm:** The maximum permissible load on the hammer mill motor can be set in the interface. Interlocks the feeder to prevent overload and damage of hammer mill.
- **Screen tension system:** Ensures that the screens inside the mill are properly tensioned. If the tension is too low or high an alarm will be triggered, indicating the system requires adjustment.
- **Feeder and Hammer mill coordination:** The feeder does not start unless the hammer mill is running. A delay start feeder function (10 sec) ensures sequential and safe start-up, preventing faulty operation.
- **Zero-speed sensor:** Detects when the rotor is completely still, confirming the hammer mill is safe for maintenance or inspection.
- **Explosion switch:** Monitors for explosion switch signals. If the signal is missing, or if dust explosion occurs, the mill ceases operation to prevent hazardous conditions.
- **Screen and guide plate feedback:** The system checks whether the guide plates and screens are in the correct position before running. Alarms are triggered if the guide plate or screen tension systems fail, preventing improper operation.

COLLECTION BIN & FILTER MODULE

The grinded material is sucked into the discharge dome through a filter unit with a fan. The dome is equipped with a transport screw and an airlock to block potential false air supply from the downstream equipment.

Outlet Configuration Screen

OUTLET CONTROL:

- **Filter control system:** Controls the filter cleaning system, with adjustable intervals between cycles to ensure the filter stays adequately clean.
- **Fan:** The fan is normally operated at constant speed. However, if mounted with a VSD fan speed may be reduced between batches to preserve energy and reduce noise.
- **Discharge screw:** The discharge screw transports the ground material away from the collecting bin at fixed speed.
- **Level switch:** Signals upstream when the bin is full. It interlocks the dosing module to halt dosing until the discharge dome is properly cleared, preventing blockages and overfilling.
- **Adjustable alarm delays:** Delays for alarms related to the screw, fan, filter and/or airlock not operating, or if downstream signal is missing, prevents false alarms from temporary conditions, ensuring only sustained issues trigger alarms or emergency stops.

GRINDING CONTROL

FUNCTIONAL SCOPE

Functional Unit	Unit Type	Functional description	Panel System
Pre-bin	LIVE BIN, TYPE VB	• Mixing screw with asynchronous gear motor • Slide gate • Level indication of bin	★
Dosing	Pocket Feeder/Feed screw	• Overflow monitoring • Variable dosing of meal • Level indication of bin • Automatic start of feed screw	●
Separation	Separator	• Deflector plate • Magnet • Magnetic safety switch	★
Grinding	MultiMill 1400D, 1000B, 800B, 630B OptiMill 500, 700, 900	• Asynchronous motor • Pneumatic air cylinder piloted by 2 coils with two reed/position sensors. • Safety interlock switch with lock • Evaluation system for safe standstill monitoring • Main motor amperage process value • Temperature process value on the motor side of the hammer mill chamber	●
Outlet control	Collection Bin & Filter	• Filter control unit power • Radial fan control • Dome screw control • Outlet airlock • Full level indication	●

● included
– not included
★ optional addition

GLOBAL SUPPLIER – LOCAL PRESENCE

ANDRITZ Feed & Biofuel is truly a global organization – with local presence. We are represented all over the world. The global market is served from five main locations in Denmark, China, Netherlands, USA, and Slovakia.

In addition, ANDRITZ Feed & Biofuel operates from several strategic regional sales, engineering, and service locations in Australia, Bangladesh, Brazil, Canada, Chile, Dubai, France, Germany, India, Italy, Mexico, Poland, South Africa, Thailand, Turkey, the UK and Vietnam – and is also represented locally by agents and distributors in many other markets.

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