



SEPARATION EXPERTISE FOR YOUR SUCCESS IN LITHIUM PRODUCTION

ASK YOUR SEPARATION SPECIALIST

ANDRITZ

ENGINEERED SUCCESS

The right tools for energy and cost-efficient lithium production



Need to maximize brine extraction? Optimize the extraction of lithium carbonate, hydroxide or chloride? Improve product purity and process water recovery alike? Reduce your energy consumption or ensure minimum downtimes? Gain value out of by-products like potash and sodium? Whatever your specific need in your beneficiation, extraction and tailings treatment process is, our aim is to put all the right solutions at your fingertips to ensure your success. With one of the broadest portfolios of separation solutions and over 60 years of experience in the lithium industry, we have a full array of tools for optimizing both plant performance and product purity.

With our innovative environmental products and solutions for decarbonization and circular economy, we enable our customers to achieve their sustainability goals and make the world a greener place. We are proud of what we do at ANDRITZ. We are not only delivering technologies, but also creating a positive impact for our planet and society.



**FOR A BETTER FUTURE.
FOR A GREENER PLANET.
FOR THE CHANGE.**

Accelerating high-purity lithium production with lower energy costs

Lithium is highly sought after raw material with rising demand, due the pivotal role of li-ion batteries in electric vehicles, portable electronics and storage for renewable energy. A growing market and competition increase the need for an energy- and cost-efficient production, which maximizes lithium recovery from the source material, removes impurities and ideally valorizes by-products as well.

A LARGE PORTFOLIO AND A NUMBER OF REFERENCES

High product throughput is, of course, critical to reliable and cost-efficient production of all types of battery minerals. This is why many larger producers have chosen us for high-capacity separation equipment with low operating and energy costs for some of the highest volume operations worldwide. It all started in the 1960s, the first ANDRITZ pusher centrifuge for lithium carbonate, which operated for over 60 years. Our robust separation technologies not only withstand a long lifetime of continuous use, but also cover the entire process from dewatering to purification and drying. In addition, we are continuously developing new technologies specifically adapted for lithium mines such as the SmartFILTERCLOTH.

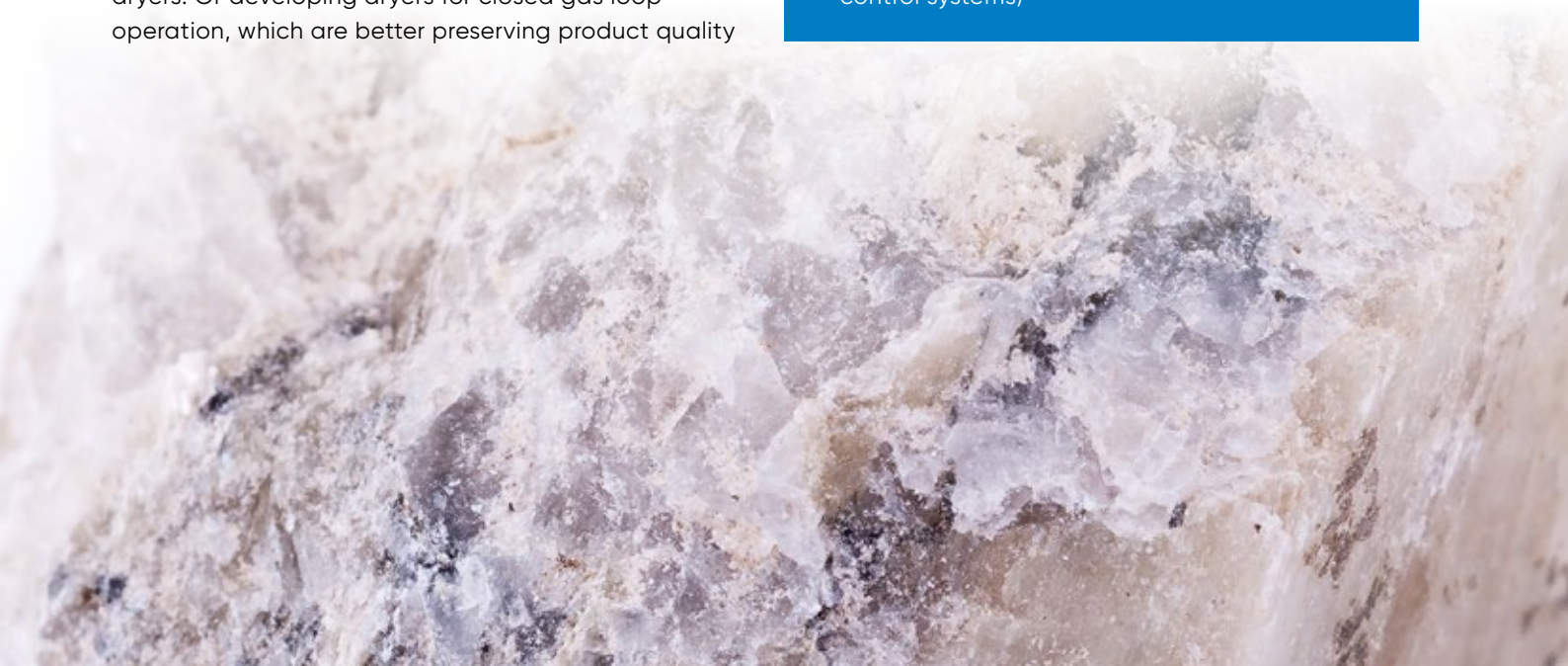
REDUCING ENERGY CONSUMPTION AND WASTE

Always striving to become better with and for our customers, we are exploring new ways of improving efficiency in separation. One example is the use of centrifuge technology instead of vacuum filtration for dewatering, achieving lower moisture levels and enabling the use of smaller and more energy efficient dryers. Or developing dryers for closed gas loop operation, which are better preserving product quality

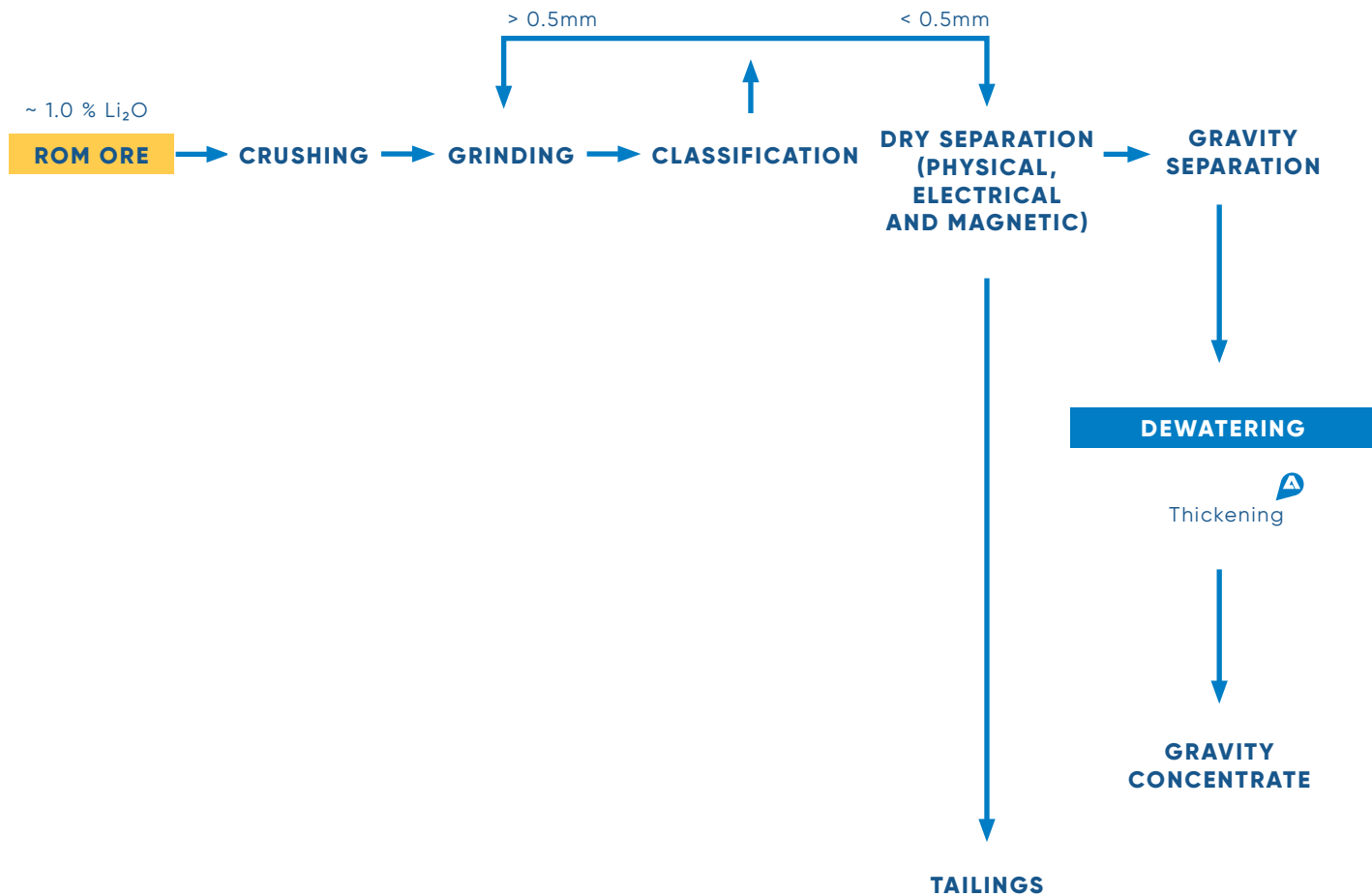
while conserving energy. By extracting and valorizing by-products like potash and sodium, improving process water recovery or partially automating the tailings treatment process we are also contributing to improving efficiency and minimizing environmental impact at the same time.

YOUR BENEFITS WHEN WORKING WITH ANDRITZ

- Global presence in 40 countries on all continents, including Australia, Chile, China or Brazil
- One of the largest portfolios covering the entire solid/liquid separation process
- One partner for the whole dewatering process, including the removal of impurities, valorization of by-products and tailings treatment
- A large track record of solutions which are easy-to-operate and maintain
- Extensive process know-how, proven by multiple references
- Modern automation solutions (Metris addIQ control systems)

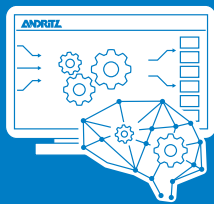


Where we support your spodumene concentrate beneficiation process



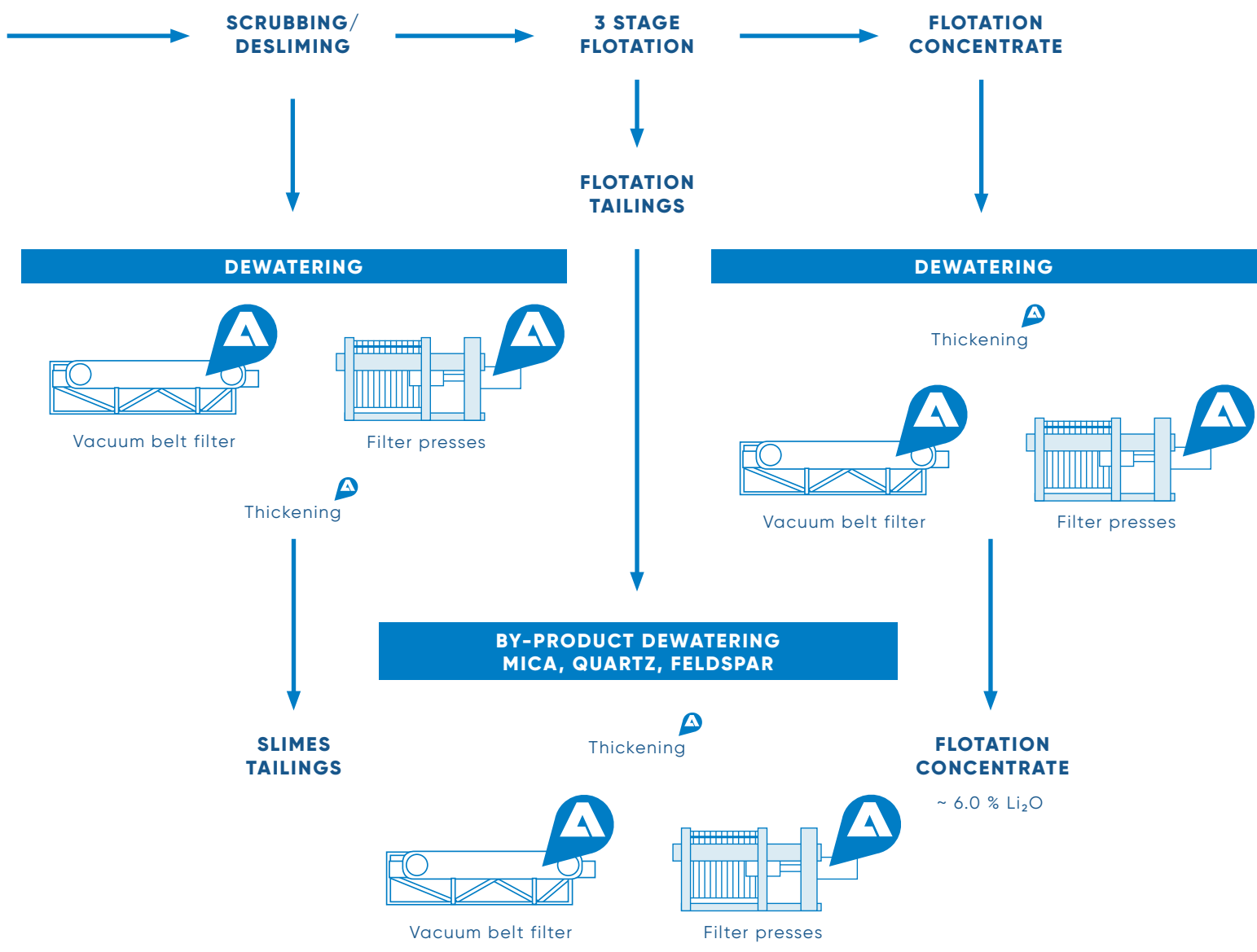
SERVICE & AUTOMATION PORTFOLIO

- Metris addIQ control system upgrade
- ATEX upgrades
- Service level agreements
- SmartCLEAN cloth washing device for filter presses
- Plate package upgrades for filter presses
- Cake washing and air blowing upgrades for filter presses
- SmartLIFT lifting device for vacuum belt filters
- Metris addIQ ACE for filter presses

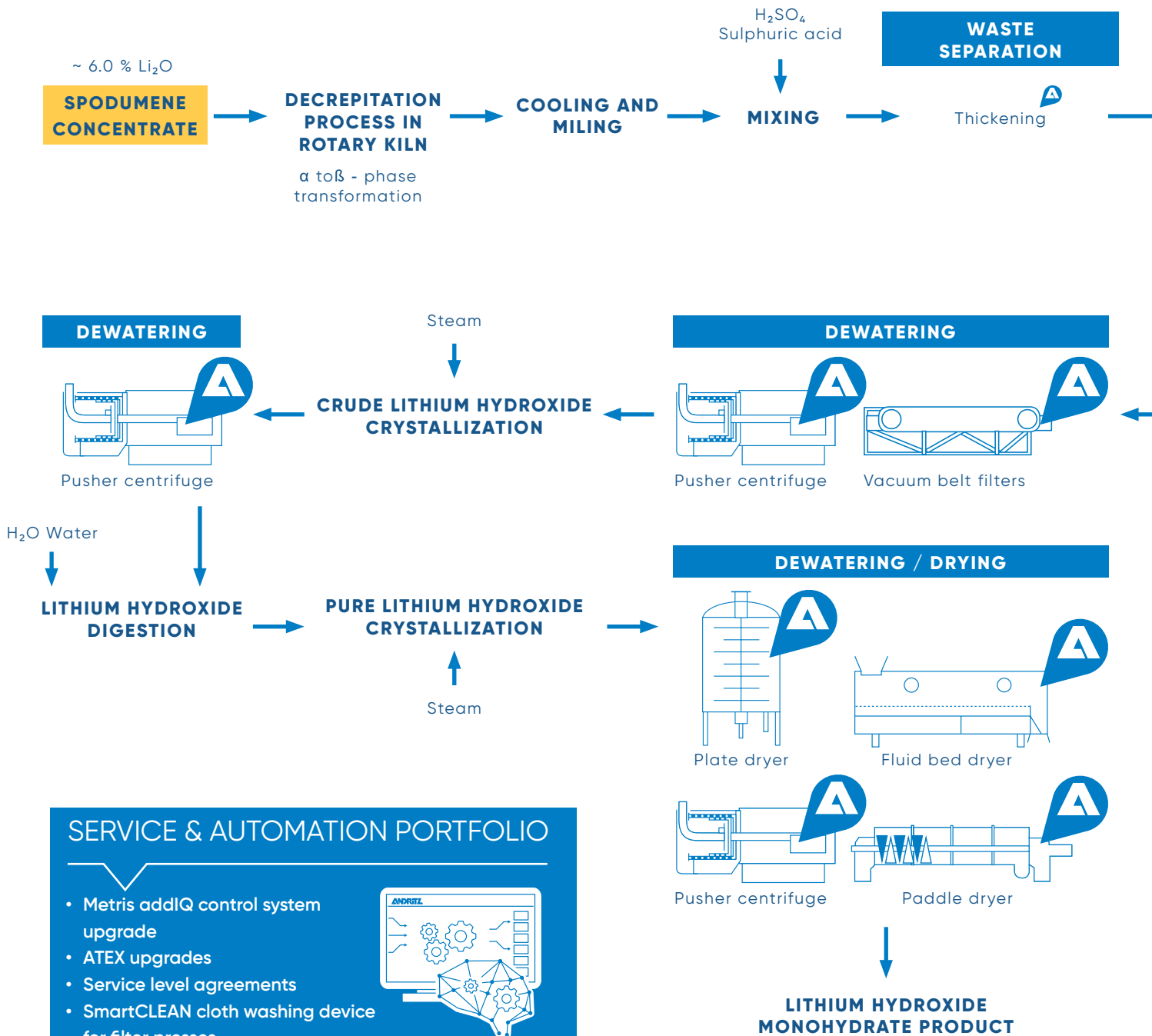




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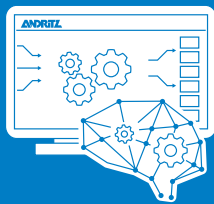


Where we support your lithium extraction from spodumene concentrate process



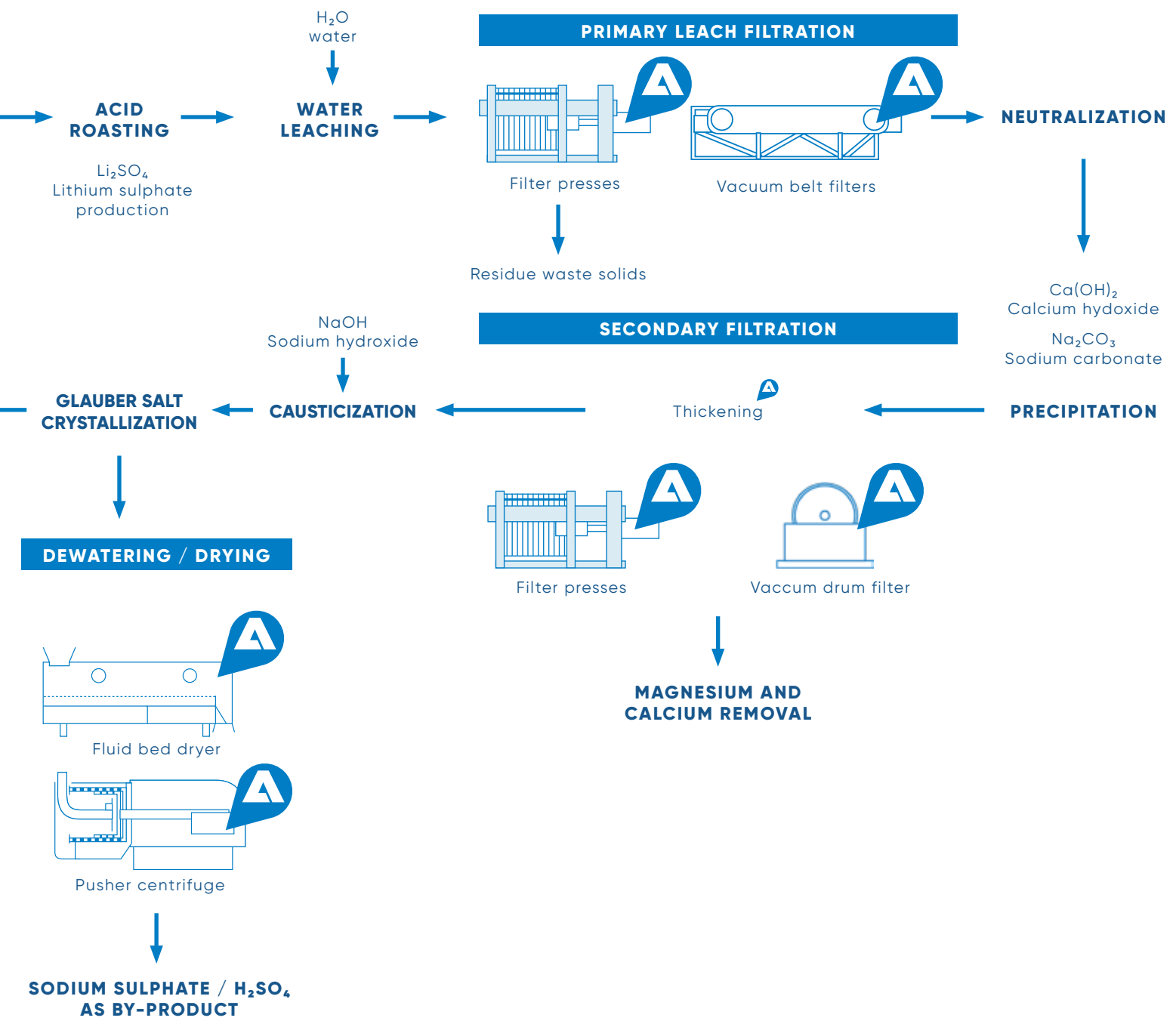
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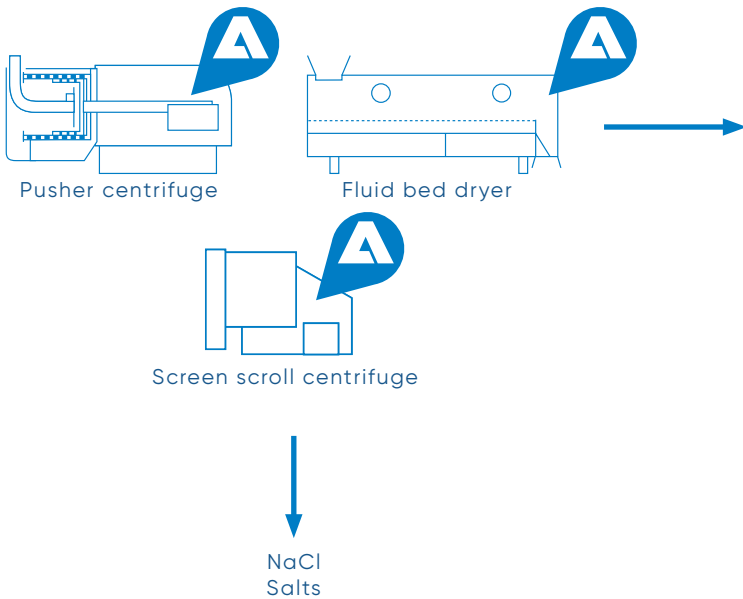
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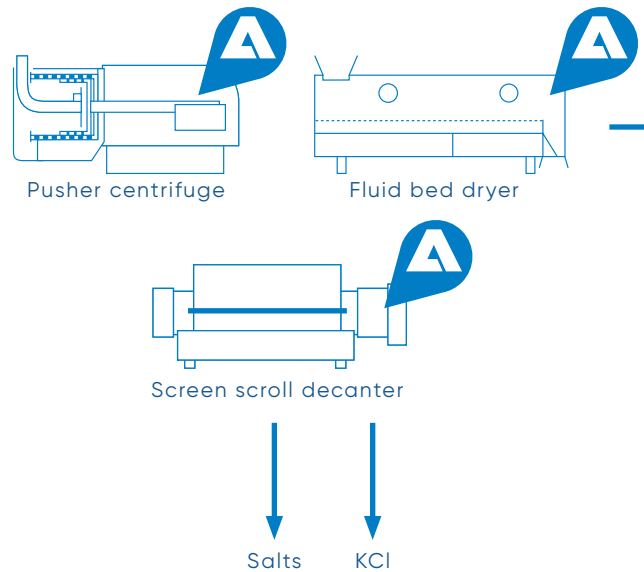
Where we support your brine concentrate beneficiation process

~ 0.16 % Li₂O

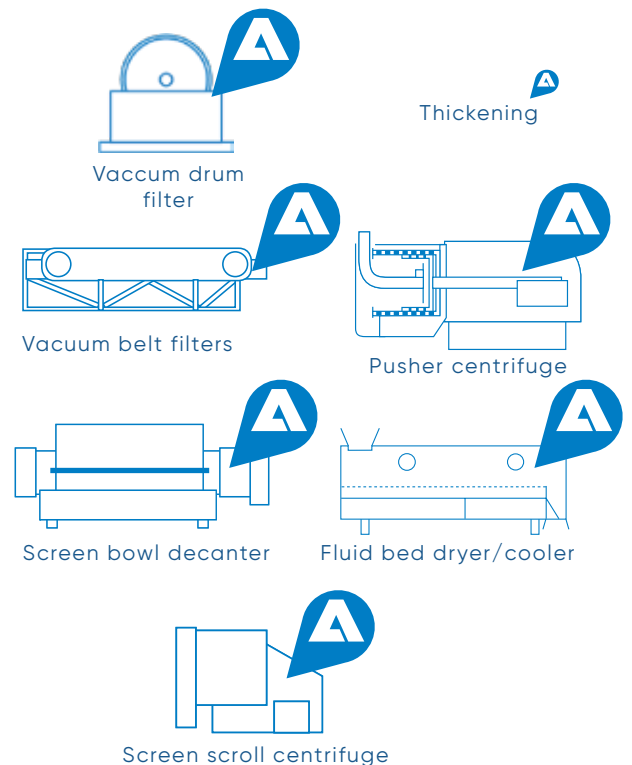
HALITE POND



SYLVITE POND

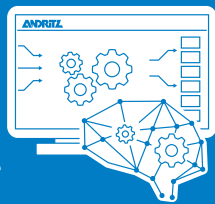


KCI POTASH PLANT



SERVICE & AUTOMATION PORTFOLIO

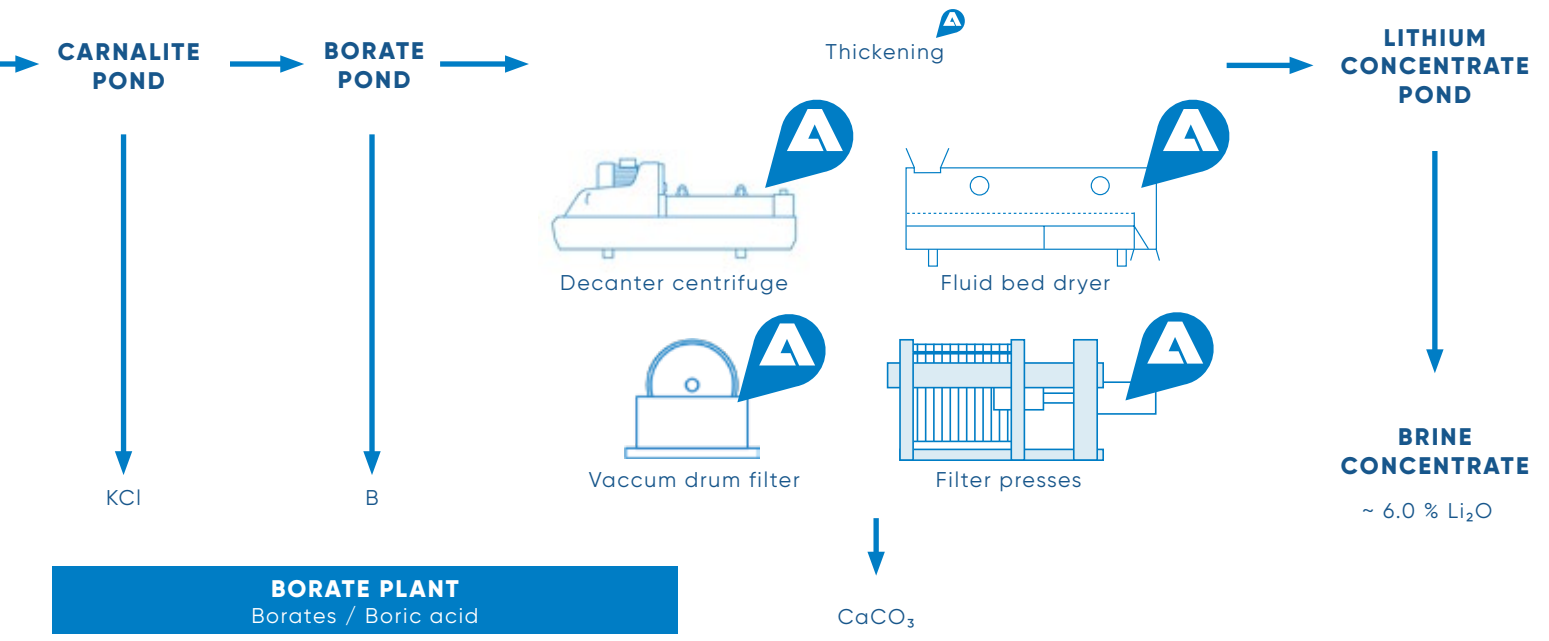
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CARBONATE PRECIPITATION POND



Where we support your extraction from brine concentrate process

HCl Hydrochloric acid

ACID LEACHING

~ 6.0 % Li₂O

LITHIUM BRINE FROM POND

THICKENING

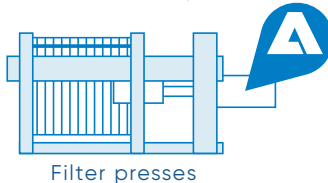
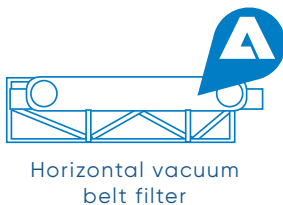
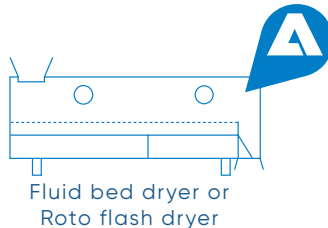
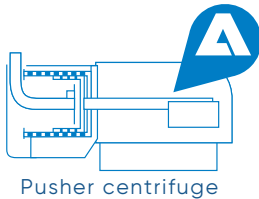
Thickening

FILTRATION

Vacuum drum filter

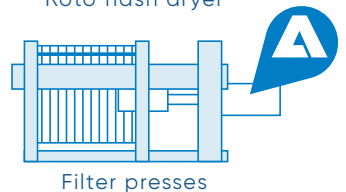
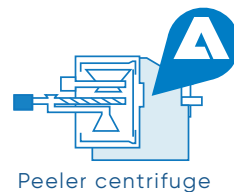
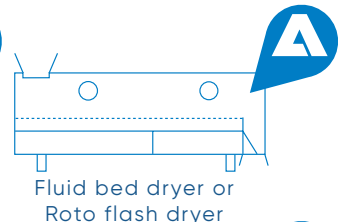
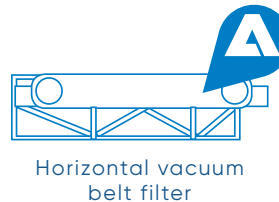
LiCl CRYSTALLIZATION

DEWATERING / DRYING



LITHIUM CHLORIDE

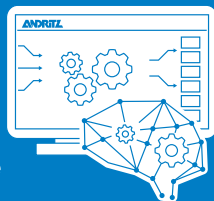
DEWATERING / DRYING



LITHIUM CARBONATE TECHNICAL GRADE

SERVICE & AUTOMATION PORTFOLIO

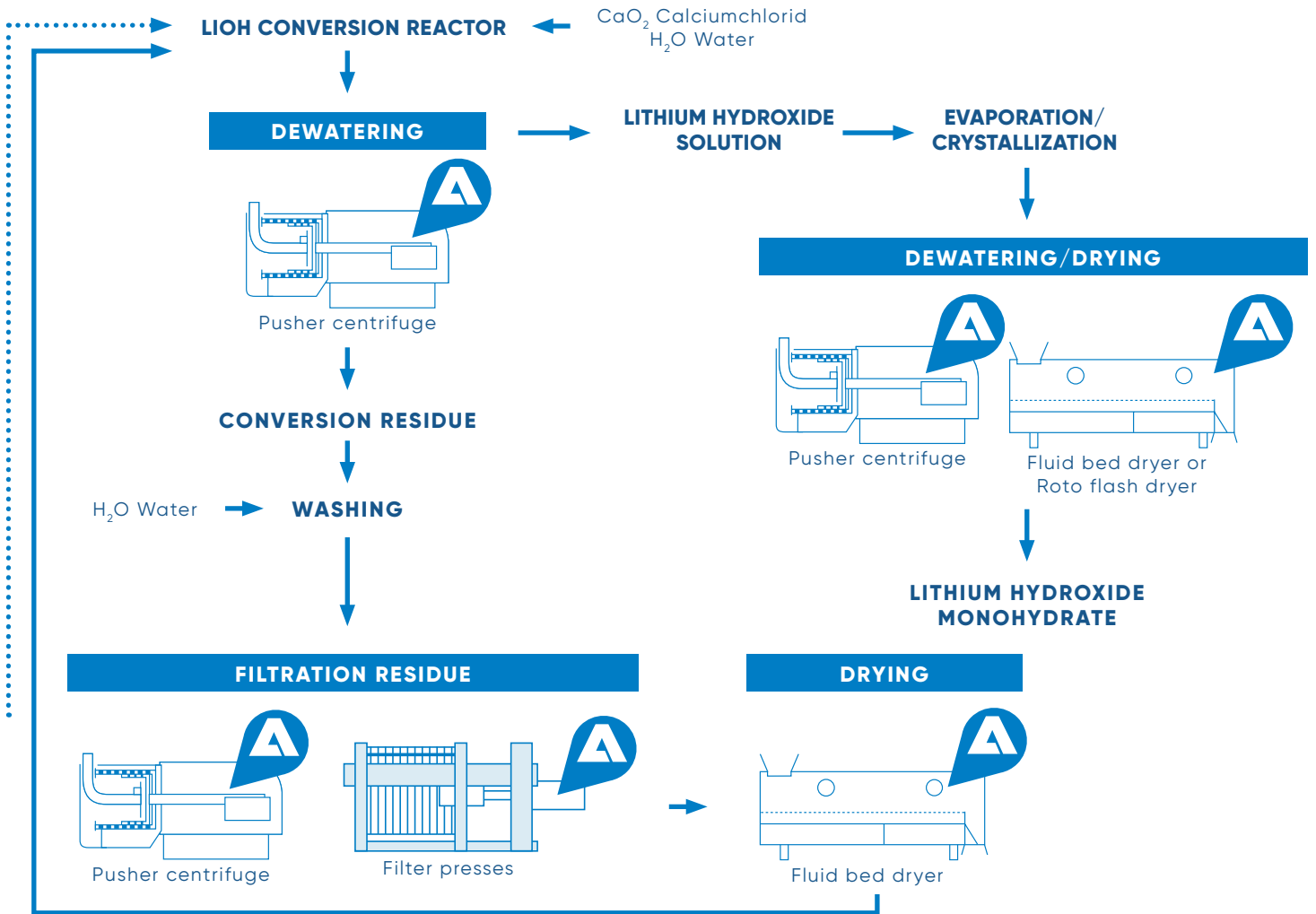
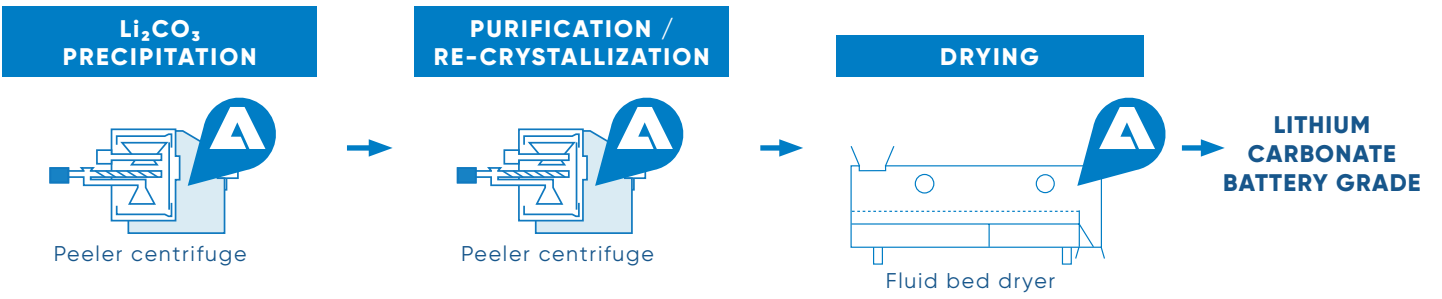
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Na_2CO_3 Sodium Carbonate





Metris

ANDRITZ Digital Solutions

Improving quality and conserving energy

Is your business the best it can be? Perhaps you have untapped potential to reduce production losses and maximize availability? Even with the best equipment, there is always room for improvement in performance, productivity, and profit. Metris addIQ control systems deliver all three. addIQ control systems are part of Metris, the ANDRITZ brand for digital solutions – which is the

combination of expertise, technologies, and products. The brand includes both digital solutions and Smart Services, which are arranged and adapted individually to meet the requirements of every single customer – even exploiting the capabilities of systems already installed and measurably enhancing plant performance.

The Metris addIQ portfolio

Various Metris addIQ packages allow every business with separation processes to optimize its performance. Choose the features that meet your separation challenges the best.

FEATURES	PURE S*	ECO	DYNAMIC*	PRIME	FLEX
Compact retrofit design	x				
Cost-efficient solution for standalone machines	x	x			
Specific machine control functions		x	x	x	
HMI panel for monitoring and parameter set up	7"	7" with upsacle possibility	10" touchscreen with upsacle possibility	15" touchscreen	
Easy integration into overall control systems		x	x	x	
Ready for future functional updates		x	x	x	
Basic trending functions		x	x	x	
Monitoring and control of machine and machine auxiliaries			x	x	
High-end trending, optimization and diagnostic functions				x	
Metris addIQ Connect	Option	Option	Option	included	
Metris addIQ Monitoring	Option	Option	Option	included	
Metris addIQ Optimizing	Option	Option	Option	Option	

Customized solution to meet specific customer mill standard

*only available for selected equipments

OPTIONS

METRIS addIQ CONNECT

Metris addIQ Connect connects your machine with the safe ANDRITZ environment and enables remote support for fast interaction between your machine and the ANDRITZ specialists.

METRIS addIQ MONITORING

This monitoring tool allows you to monitor the health status of your machine 24/7 from anywhere in the world.

METRIS addIQ OPTIMIZING

Our Metris addIQ Optimizing analysis tool and the ANDRITZ specialists find ways for you to save money and stabilize and increase the production of your equipment.

EX proof

Tailor-made automation solutions to meet explosive hazard requirements.

Advanced automation for lithium producers

Customers with new or existing operating plants worldwide are benefiting from ANDRITZ turn-key control system solutions, customized to fit their specific process and plant. Process areas include dewatering and drying automation solutions to enhance availability, optimize operations, reduce energy consumption, and minimize production costs.

IDEAS SIMULATION TECHNOLOGY FOR MINING OPERATIONS

IDEAS is a leading dynamic simulation software for mining operations that helps customers to save time, money, and resources. IDEAS simulation provides value as a real-time first principles based Digital Twin for your plant operations. We build process models of your facility based on P&IDs, pump curves, chemical reactions, and other key components of the process. We then connect these models to an offline version of the actual control logic. Months before start-up, we run a simulated start-up and then verify and correct control logic against this "virtual plant." These models are then used for operator training, de-risking the overall project.

WATCH THE VIDEO
to learn more about
the IDEAS technology



AUTONOMOUS CONTROLS

Starting your plant with the right level of automation is the quickest way to achieve target production while reducing operating costs and energy costs. Combining ANDRITZ IDEAS - Digital Twin and Fit-For-Purpose Advanced Control System, levels your plant up to give it the edge above others in today's industry.

EIC (ELECTRICAL, INSTRUMENTATION, CONTROLS)

As a single point of responsibility (EPC) for the control system supply, you will benefit from a Seamless Integration.

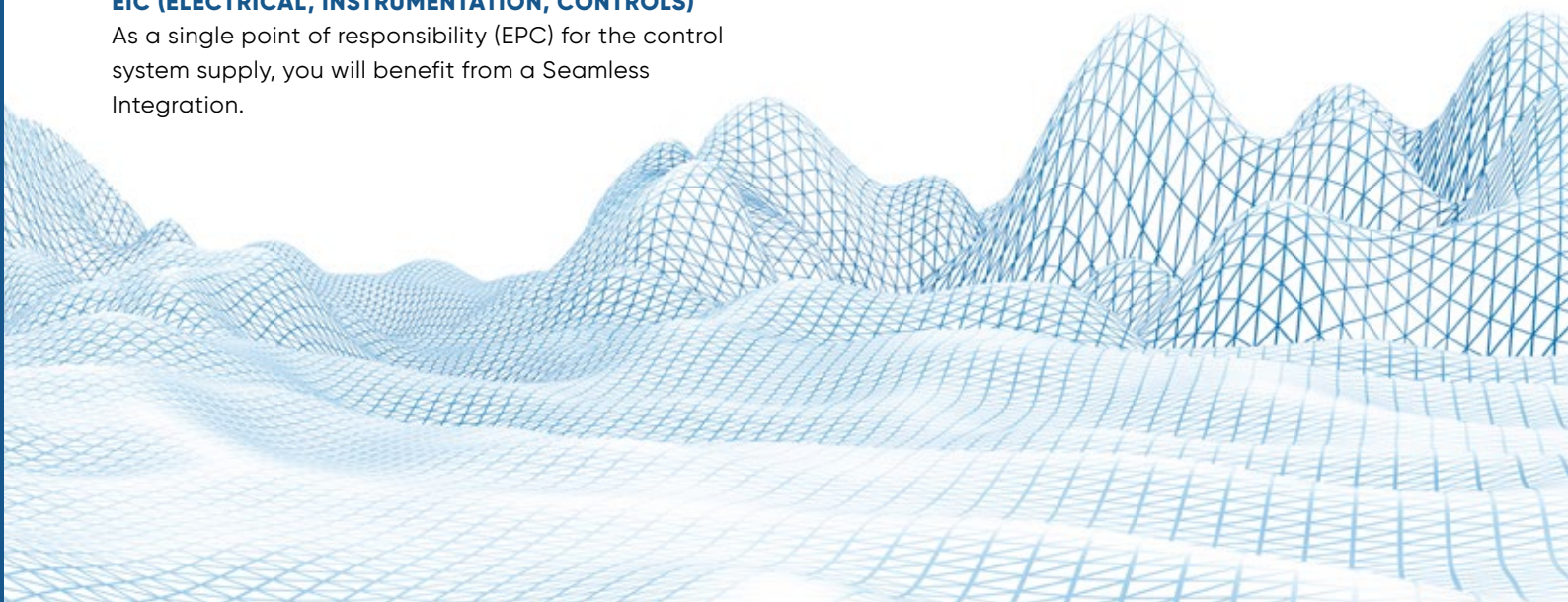
METRIS ALL-IN-ONE DIGITAL PLATFORM

The Metris All-in-One digitalization platform provides full support for industrial plants throughout their entire life cycle. It combines a complete set of functionalities for professional production management, simulation and optimization using the latest artificial intelligence methods, plus cyber security, remote and condition monitoring with smart sensors in an integrated approach.

METRIS addIQ ACE - HIGHEST PERFORMANCE WITH OPTIMIZED MULTIPLE LINES

Operators, constantly, need to consider many aspects of operation such as throughput bottlenecks, availability of water, operation status in up-stream and down-stream. Metris addIQ ACE considers all the mentioned aspects, automates the decision making process and optimizes operation in a unified and holistic way.

WATCH THE VIDEO
Metris addIQ ACE – how does
it work for filter presses?



Our separation portfolio for your lithium production

Screen scroll centrifuge HX

Reliable and offer stable performance, even under difficult feeding conditions



YOUR BENEFITS

- Maximum uptime and easy maintenance with the express cartridge
- Convenient and efficient maintenance as a result of the patented and modular scroll design
- Reduced wear and particle attrition enabled by the Gentle Feeder™ feed system
- Ability to deal with low or varying feed concentrations, high viscosities, or interrupted feeding

Vacuum drum filter

Reliability in quality, at low production costs and high efficiency



YOUR BENEFITS

- Maintenance friendly (slow rotating) equipment with a small footprint
- Excellent cake and filter cloth washing
- Process adaptations possible (high flexibility)
- Customizing options such as gas-tight to pressure belt designs (ATEX)

Overhead and sidebar filter presses

Suitable for standard, medium duty, and heavy-duty performance levels, as well as processing aggressive media with high throughputs



YOUR BENEFITS

- Flexible in filtration area, throughput and process changes via cloth change
- Fast discharge via plate package divider
- High chemical resistance
- High pressure washing cloth device (SmartCLEAN)
- Wide range of automation options up to an intelligent filter press



Decanter centrifuges

Solid bowl and screen bowl decanter centrifuges, optimized to maintain maintaining high performance and ensuring long lifetime of the machinery



YOUR BENEFITS

- Ability to handle large variations in feed solids, process variability, and plant upsets
- Wide range up to the largest machines in the industry with the highest capacities
- Extensive experience in in high wear mining operations, tailored for high up-time and easy maintenance
- Available in atmospheric, sealed, or pressure designs
- Significant experience in zero-liquid-discharge and water treatment

Horizontal vacuum belt filter

Highest throughput and low residual cake moisture content, while keeping operating costs low



YOUR BENEFITS

- Excellent cake washing efficiencies for high purity product
- Special materials of construction for wetted parts (for handling high brine/corrosive conditions)
- High throughputs with low cake moisture contents
- High cake washing efficiencies with low wash water requirement

Peeler centrifuge HZ

Fully automated batch centrifuge, easy adaptable to changing process requirements



YOUR BENEFITS

- Highest purity product thanks to flexible and effective washing procedures with low wash water consumption
- High G-Force for best dewatering results and low drying costs
- Small machine footprint
- Fully closed design, avoiding any contamination
- Adjustment to varying process conditions due to proven Siphon basket technology for BG Li_2CO_3

Pusher centrifuge SZ

Robust dewatering technology for decades

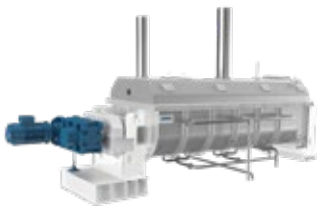


YOUR BENEFITS

- Higher hydraulic capacity
- Handling of low fsc possible
- Elimination of the hydro-cyclone in front of the centrifuge possible
- Operation under CO₂ free conditions possible
- Long lifetime up to 60 years (first pusher centrifuge for lithium carbonate)

Paddle dryer

Fully enclosed dryer, for preventing contamination from the atmosphere and high operator safety



YOUR BENEFITS

- Uniform product treatment: Applicable for both LiOH monohydrate as well as dehydrated LiOH
- Larger capacities possible (when compared to e.g. plate drying)
- Tungsten-carbide coating available for abrasive product
- Indirect heating results in small off-gas treatment

Plate dryer

Vertically designed, continuous contact dryer/cooler available in atmospheric, gas-tight, or vacuum configuration



YOUR BENEFITS

- Accurate residence time resulting in accurate monohydrate content
- Vacuum processing possible
- Gentle process preventing particle breakage



Fluid bed drying and cooling systems

Closed drying system with multiple customization options



YOUR BENEFITS

- Closed loop systems to reduce contamination, with no rotating or moving parts present in the product layer
- Reliable control of the system based on proven concepts for temperature control and the choice of thermodynamic equilibrium conditions as design basis
- Variations in throughput or feed moisture are automatically balanced by adjusting temperatures inside the system. Drying result is independent from residence time.
- Process design assures that monohydrate stage is preserved. Over-drying (removal of crystal water) can be adjusted from zero up to several percent
- Steam, thermal oil, (indirect) gas heaters, hot water as well as electrical heating

Roto flash dryer

Production of lithium powders from cakes, pastes and fluids



YOUR BENEFITS

- Compact single pass dryer
- No external back-mixing or product reintroduction
- Integrated internal feed agitation for gentle mechanical dispersion
- Inlet temperatures as high as 750 °C
- Short air residence time
- Cost efficient

Spray dryer

Production of lithium powders from liquid slurries and suspensions



YOUR BENEFITS

- Full scale plants from 10,000 - 30,000 tons/year production
- Modular semi production development plants (50 - 100 kg/hr evaporation)
- Lower maintenance and simple operation

ATOMIZATION METHODS

- Air Assist Pressure Nozzle (AAPN) atomization for ultra-fine powder
- Air Bearing Rotary Atomizer (ABA) for high capacity dryers

WATCH THE VIDEO
to learn more about
the spray dryer





R&D

—

YOU'VE GOT AN IDEA. WE'VE GOT THE CAPABILITIES. LET'S CREATE A SUCCESSFUL CONCEPT.

Let's be brilliant – together

No one knows your operations better than you. And no one devotes more resources to advancing the science of mechanical and thermal separation than ANDRITZ. Together we can discover new ways to bring your product to the market more efficiently, affordably, and reliably than ever before.

Investing in R&D in solid/liquid separation is critical to meeting the demands of tomorrow's mining and minerals industry. Which is why we continuously collaborate with customers and leading universities to go beyond the limits of current technologies. Whether you are looking for cutting-edge filtration technologies, innovative drying solutions, or a more straightforward performance upgrade, we can find ways to do it better.

How do we know? Because we do this every day for many of the largest cities and most advanced mining facilities across the globe. Because your challenges are complex and because many of our customers are based in remote locations, we provide accessible mobile test equipment so you can test your parameters on-site and be assured of an easy transition to industrial scale. Whatever your ambitions, we can provide the knowledge and capabilities to support your goals.

Our brain power is your strength

LAB TESTING FACILITIES

- Europe: Austria, Germany
- North America: Texas
- South America: Brazil
- Asia Pacific: China, Singapore

MOBILE TESTING FACILITIES

- Europe: Germany
- North America: Texas
- Asia Pacific: China, Singapore

3% of our sales are reinvested in R&D



Your full-service provider

With ANDRITZ, you gain access to one of the world's largest OEM manufacturers for solid/liquid separation systems, including such well-known brands as 3Sys Technologies, Bird, Dedert, Delkor Capital Equipment (Pty) Ltd., Escher Wyss dryers, Guinard Centrifugation, KHD Humboldt Wedag, Krauss-Maffei centrifuges, dryers, and filters, Lenser, Netzsch Filtration, Rittershaus & Blecher, Royal GMF Gouda, Sprout Bauer, and Vandebroek.

Whether you need spare parts, rentals, local service, repairs, upgrades, or modernization of your equipment, ANDRITZ is your true full-service provider. From initial consulting through to service agreements, process optimization, and training programs, we are always looking for ways to minimize downtime and increase

predictability in operations while raising your overall production efficiency. Wherever you operate, our network of 550 service specialists and global service centers ensures we'll always be there to support you for many life cycles to come. Let's sit down and see how we could take your operations to the next level.



LOCAL SUPPORT

Responsive local service centers and field service technicians



REPAIRS & UPGRADES

Optimization of machine and process performance, repair work, retrofitting, and modernization



SECOND-HAND & RENTALS

Certified second-hand and rental machines



TRAINING

Operator training and tailored seminars for operating and maintenance personnel



OEM SPARE PARTS

Filter cloths, spare and wear parts from OEMs or with OEM level quality, all readily available



SERVICE AGREEMENTS

Preventive maintenance, contracts for spare parts, maintenance, inspections, repairs, upgrades, operation, and equipment monitoring



PROCESS OPTIMIZATION

Automation tools and process expertise to boost your profit



LAB AND ON-SITE TESTS

Lab and testing capabilities for process optimization and machine upgrades



WHAT'S YOUR SEPARATION CHALLENGE?

ANDRITZ Separation provides mechanical and thermal solid/liquid separation technologies, complemented by comprehensive services and automation and digitalization solutions for the chemicals, environment, food and beverage, as well as mining and minerals industries. The customized, innovative solutions focus on minimizing the use of resources and achieving highest process efficiency, thus making a substantial contribution towards sustainable environmental protection. With over 150 years of experience and more than 2,400 specialists around the globe, ANDRITZ Separation is a driving force in the evolution of separation solutions to meet tomorrow's changing demands. Wherever you are and whatever your separation challenge – **Ask your separation specialist!**

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