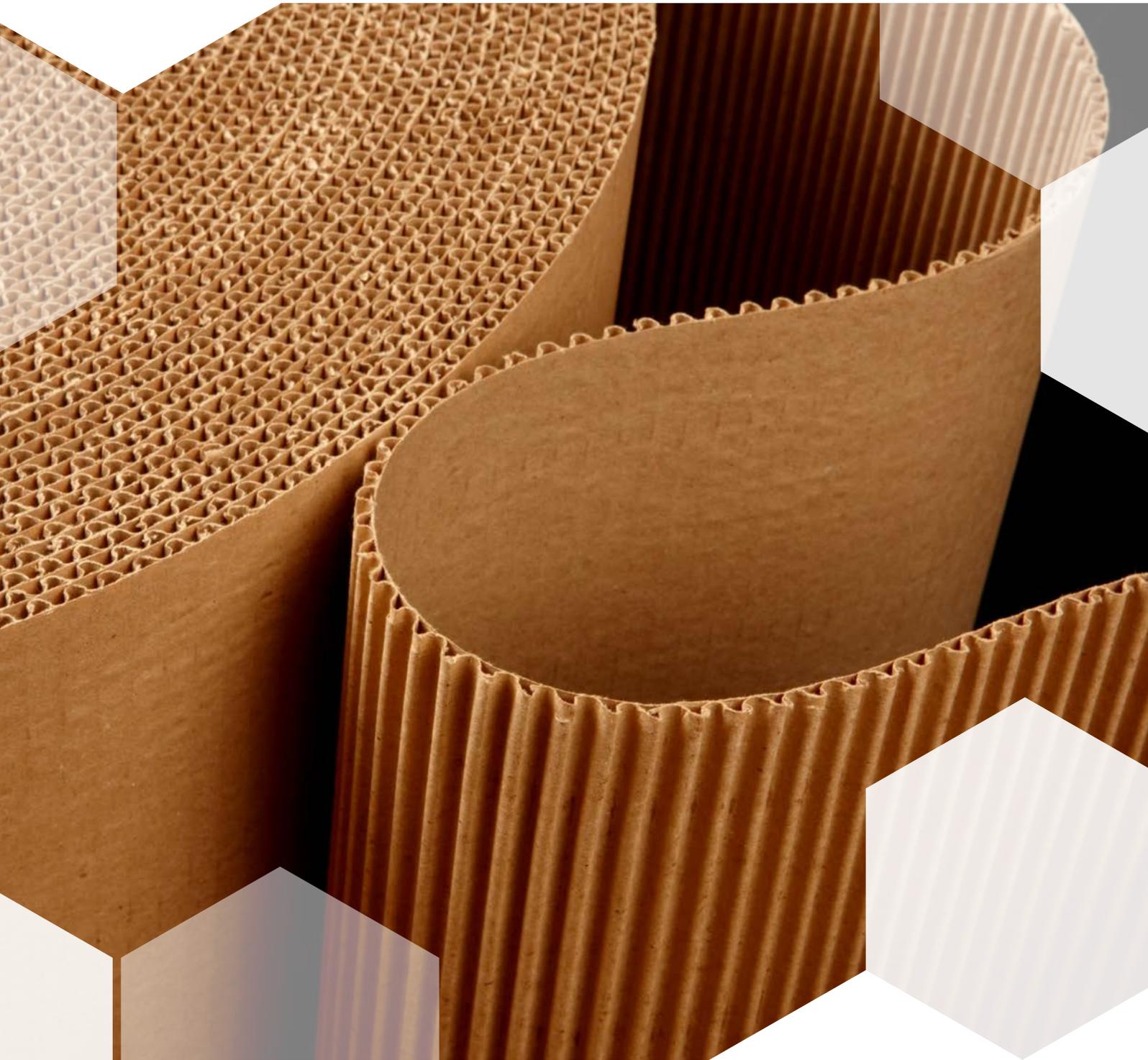


SUPERIOR SERVICE AND SUPPORT FOR PACKAGING MACHINE CONVERSIONS AND START-UPS

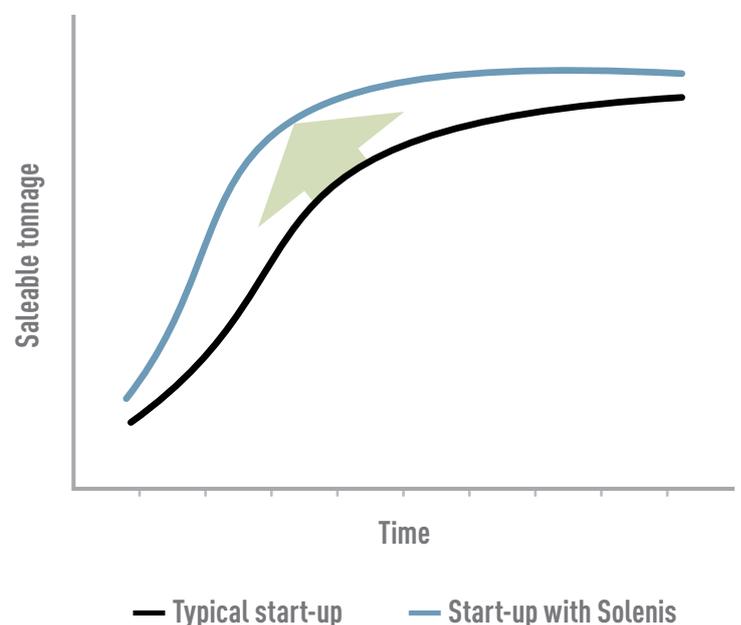




Start with Solenis

With 215 million tons of packaging paper and board being produced every year, packaging material accounts for half of all worldwide paper consumption. This demand has led to an increase in packaging machine start-ups, especially in China and other emerging markets. Conversions — from newsprint to linerboard, for example — are also becoming increasingly common. Either way, greenfield or brownfield, starting up packaging machines and getting them optimized for full capacity is an enormous challenge and a significant capital investment. It's no wonder why mills spend years planning — because paying attention to every detail ensures success.

Solenis has been paying attention to papermaking details for more than 100 years. From a robust R&D operation to a frontline team of sales, technical and applications specialists to dedicated field equipment service and maintenance, we have the right products, people and processes to help papermakers maximize productivity and profits while improving their sustainability targets. Solenis specializes in packaging machine start-ups, and we understand the vast array of grades across the wide range of machine configurations that comprise this market segment. Because of our extensive experience and commitment to excellence, we have a proven track record helping mills accelerate their start-up curve with an advanced portfolio of products.



A Start-up Strategy

Solenis works closely with customers early in the planning process to ensure that appropriate applications and systems are designed and integrated from the ground up to avoid bolted-on solutions that may deliver suboptimal results. We assign a project manager to each installation who serves as the primary liaison between mill staff and Solenis. Often, for existing customers, this person is an account manager who is already familiar with a mill's layout and operations. Either way, the Solenis project manager leads a team consisting of Applications Specialists, with detailed knowledge of chemistry systems, Equipment Specialists, with training in mechanical and electrical engineering, as well as employees with a strong pulp and papermaking background.



We work flexibly with customers during their discovery and planning. In some cases, we provide insights and market data specific to the grades being considered, the chemical programs required, costs, and any energy or environmental components. In other cases, mills come to us after they've made these assessments and have already made a decision to build a new machine or proceed with a conversion. In these situations, we can prepare a full set of recommendations that addresses all of the machine-level considerations. Solenis has experience with all types of grades produced across the full spectrum of single- and multi-ply board machine configurations. Our team collaborates with key personnel to understand all of the integrated technologies required to produce a specific product and then develops a comprehensive start-up plan that includes selection of appropriate chemical applications, dosing and monitoring equipment, storage needs and operator training, all with the goal of making sure that both mill and machine are ready to start on time and reach full production targets as rapidly as possible.

All of these start-up services are backed by the full breadth and depth of Solenis' experience in the global paper and pulp industry. We have extensive knowledge of industry best practices and a complete portfolio of chemistries, application systems, monitoring and control tools to help boardmakers design customized programs, minimize risk and maximize outcomes. Plus, as a single-source supplier, we can streamline start-up operations by reducing the number of third-party players, eliminating project hand-offs and facilitating knowledge transfer.

Start-up Specialists

Solenis leads the industry in successful machine start-ups and conversions. Consider these numbers, and see how Solenis can make the difference.

>50
complex machine
start-up experts

>10
decades of
experience in
packaging

>100
conversions, start-
ups, and rebuilds
since 2010

>2,500
machines operating
with Solenis
chemistry

Quality, Comprehensive **Solutions**

Maintaining and optimizing an existing chemical program is one thing — designing and commissioning a high-performing program for a new machine, major rebuild, or grade conversion is entirely different. These types of projects require evaluating all systems, pilot testing proposed programs and ongoing optimization through the start-up phase. They also require a partner that's more than a chemical supplier — a company that has a broad portfolio and the deepest experience in all facets of papermaking to ensure you meet your quality, productivity, regulatory, environmental, cost-management goals and deliver on sustainability objectives.

Solenis is that partner. We're one of the most respected names in papermaking, not because we manufacture hundreds of products, but because we back our products with knowledge and expertise gained in real-world operational environments. We are the global leader in both process and functional chemistries developed for the packaging market. On the process side, we offer retention and drainage aids, biocides, contaminant control agents for both hard and soft scales, wet end defoamers, coating defoamers, coating additives, and deinking solutions. Our applications specialists work with mill personnel to identify potential problem areas and develop highly targeted solutions. For example,

microbial activity, scaling and corrosion can have dramatic effects on paper machine production and end-product quality. It's feasible to address these issues after a machine is up and running, but the Solenis approach is to specify appropriate microbiological and deposit control technologies, defoamers and cleaning products as part of the startup program so that they are ready for use if required.

Our benchmark functional chemistries include alkenyl succinic anhydride (ASA), alkyl ketene dimer (AKD) and rosin internal sizing, surface sizing, and solutions for oil and grease resistance (OGR). We also offer the broadest portfolio of wet- and dry- strength resins in the industry, so we can satisfy regional demands and regulatory requirements regardless of a mill's location. Assistance with these chemistries during Original Equipment Manufacture (OEM) pilot trials can ensure that the new asset not only starts-up on time but also produces the target product quality.

Solenis' expertise extends beyond process and functional chemistries. We bring vast experience in mill water treatment to bear on major projects where production increases must occur with minimal or no increase in water use and minimal impact on energy consumption. We offer diverse solutions, including boiler and steam system treatments that can reduce freshwater dilution volumes and maximize water reuse and recycle.



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A Systems Approach

At Solenis, we know that great papermaking goes beyond great chemistry. In addition to knowing what chemical to feed, a mill must know where to feed it, how to feed it, and how to monitor and control the process in real time. That's why Solenis takes a total-system approach to papermaking — we provide a comprehensive solution, from chemicals and equipment to installation and configuration, to make sure board manufacturers have the systems they need, as well as assurance that those systems will operate at required levels and deliver specified quality targets.

Solenis has experienced personnel across the world who are able to design, procure or supply a comprehensive chemical solution. This includes an appropriately sized and located chemical kitchen, as well as equipment packages ranging from simple dosing skids to sophisticated distributed skids that interface with the paper machine DCS system to deliver target dosages to multi-ply or multi-point applications. Our equipment experts can also recommend or design specialized equipment for:

- Storage, makedown and delivery systems to help mills reduce shipping costs while producing more efficient on-site solutions and emulsions.
- Injection and mixing systems, such as Solenis' PerForm™ VMax system, an advanced technology with a proprietary nozzle that allows for high-energy mixing of the polymer and stock.
- Boiler treatment systems and clarification polymer makedown.
- Raw water and wastewater treatment makedown and delivery systems.



From Start-up to **Success**

Once a chemical program is determined, Solenis works with mill staff to optimize performance and machine runnability. This involves evaluating overall program performance, tuning control systems, and modifying targets and control limits. The testing can last several weeks or even months, but enables the start-up team to ensure the programs are meeting performance standards and production meets quality specifications.

During commissioning and start-up, the Solenis team provides troubleshooting support and provides immediate access to labs, applications experts and testing equipment to help resolve unforeseen problems. Throughout this phase, our primary goal is to increase the efficiency of the machine so that the mill can achieve its quality and sales goals as rapidly as possible.

A critical aspect of this phase is obtaining real-time assessments of the machine's changing conditions. No supplier can match Solenis when it comes to control and monitoring. Our proprietary OnGuard™ sensors, analyzers and controllers incorporate state-of-the-art algorithms and technologies that allow for superior precision and accuracy. For example, with OnGuard FC, Solenis' new felt wash monitoring system, mills can

accurately measure the pH and turbidity of Uhle box water, ensuring efficient dewatering and removal of fibers, fillers, chemicals, pitch and other impurities.

When used in conjunction with Solenis' process and water treatment chemistries, these systems ensure the optimal performance of the treated system, minimizing water and energy costs, reducing downtime and providing long-term asset protection. Our service monitoring capabilities can measure the performance of:

- Sizing chemicals
- Dry- and wet-strength additives
- Microbial control programs
- Retention, drainage, wet-end and clarification chemistries
- Forming, press, and dryer fabric performance
- Soft and hard scale inhibitors
- Raw water, boiler water and wastewater treatment systems

A Long-term Partnership

Solenis continues to provide ongoing support after the machine's production has stabilized, checking conditions, fine-tuning machine settings and documenting value delivery. The Solenis project team, which could include a project manager, account manager and application specialists, remains in close contact and provides a continuous interface with key mill personnel, including production managers, operators and quality control analysts. We work closely with these stakeholders to monitor a number of key indicators — water consumption, energy use, airborne and water emissions — to optimize the environmental performance of a start-up program and to make sure our customers develop more sustainable business practices every day.

Acquainting mill staff with the novel technologies is critical to the long-term success of the project, which is why Solenis offers on-site training — in the local language and led by Solenis sales teams, in conjunction with senior applications specialists and engineering specialists — before, during and after the start-up process.

We offer training courses that cover a number of important topics:

- Papermaking chemical safety and hazard recognition, as well as other environmental, health and safety requirements
- Basic water, pulp, and paper chemistry
- Boiler and cooling water treatment
- Papermaking “wet end” chemistry, retention and drainage fundamentals
- Sheet structure, paper properties, application and impact of wet- and dry-strength additives
- Chemical dosing equipment operation, maintenance and repair

More experienced customers take advantage of our specialized expertise to run more advanced training seminars for supervisory and technical staff. These programs build on the basic training programs by going deeper into the relationships between the solutions we offer and their process and product quality. This results in a greater understanding of specific program design, application, and appropriate monitoring and control.

For Solenis, a machine start-up is just the start of what we hope is a long and fruitful collaboration. In fact, we have relationships that span not only years but decades because we are seen, not just as chemical suppliers, but as trusted business partners, invested in their success, who continually deliver value and help you become more sustainable.





Solenis

Strong Bonds. Trusted Solutions.

Solenis supplies specialty chemicals for water-intensive industries, including the pulp and paper, oil and gas, chemical processing, mining, biorefining and power markets. Whether you want to increase production, develop new products, reduce costs or simply do more with less, we can help. With our innovative technologies, passionate people and unrivaled experience, Solenis is ready to deliver the solutions you need.

To learn more, contact your technical sales representative or visit us online.

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