

How to Deliver Sustainability with Non-contact Spray

*Cut Chemical Waste & Energy
Consumption in Textile Finishing*



By: Rick Stanford
March 2021

BALDWIN®



Rick Stanford has 35 years of textile industry experience and holds a Bachelor of Science in Industrial Management.

Rick Stanford

Business Development Manager, Textile, Baldwin Technology

BALDWIN®

Overview

4. Non-Contact Precision Spray Sustainability
5. Enter Precision Spray Technology
6. Pad-based Sustainability Challenge
7. Precise Chemistry Control
8. Zero Chemical Waste in Changeovers
9. Single or Dual-side Application
10. How Precision Spray Increases Productivity
11. Large-scale Saving Opportunities
12. The Art of Constant Quality
13. The Advantage of Total Chemistry Control
14. Wet-on-dry applications
15. Precision Spray – Sustainable Finishing



Non-Contact Precision Spray Sustainability

While consumers are increasingly focused on buying products that use sustainable materials and methods, and brands are onboard to satisfy them and to be good stewards of the environment, often neither is willing to pay more to use these types of materials or technologies.

To minimize their own environmental footprints and satisfy their customers, textile manufacturers are increasingly focused on implementing new methods and materials at a neutral cost. With a multitude of applications requiring various finishing chemistries to be applied to fabrics, non-contact spray reduces the amount of chemistry lost to waste from changeovers.

First and foremost, the objective of every retailer or brand is to provide higher, more consistent quality to the end customers and, in addition to its environmental benefits, precision spray raises the bar to new heights.

Non-contact precision spray is a revolutionary application method that enables textile manufacturers to satisfy growing demand from consumers and brands for more sustainable practices at every level of the supply chain.

This disruptive technology dramatically cuts chemical waste and energy consumption while improving fabric performance, making it the wave of the future for textile finishing, remoistening, and moistening for sanforizing and compacting.





Enter Precision Spray Technology

Baldwin's sustainable technologies include its TexCoat G4 precision spray valve technology to apply required fabric penetration for woven and knit applications with low-viscosity chemistries.

Finishing chemistries that are suitable for spray include durable water repellent (DWR), available in C6, which are fluorine-based, and C0 non-fluorine-based chemistries that are becoming increasingly popular because they are more environmentally friendly.

Amid the current pandemic and personal protective equipment (PPE) requirements, antimicrobials are in high demand and can easily be sprayed. Rounding out the list are flame retardants, wicking agents, softeners, and digital pretreatment that's used in the preparation of fabrics for the digital printing industry.

BALDWIN®

Pad-based Sustainability Challenge

The water required to process textiles and disposal of the wastewater are dual environmental concerns, and non-contact spray technology saves water on both ends of the process, while reducing electricity and gas consumption in the finishing line.

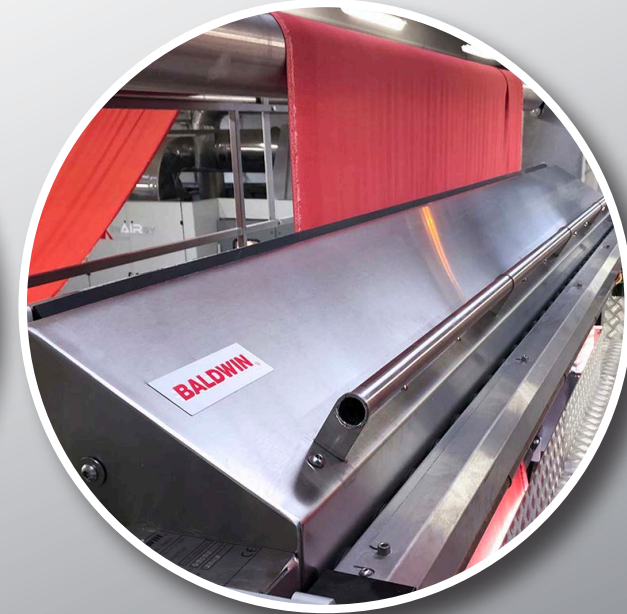
With the traditional pad-based finishing process, waste is created at every job changeover. Water is used during the padding process. Electricity is required to run the pad and stenter and gas is needed to heat the stenter to dry fabrics and polymerize chemistry. Waste is also created by periodic pad renewals. Additionally, with the traditional wet-on-wet pad method, what is commonly known as the “tailing effect” can lead to uneven coverage, requiring higher doses of chemicals to disguise the problem.

At the typical pad finishing range in thousands of locations around the world, the process of applying textile chemistries starts with a frame unwind of a batch of fabric. It then passes through up to two different pad baths, or foulards, where the chemistry is applied. The fabric then passes through the stenter range to be dried and, depending on the chemical application, polymerized.

Fabric is dipped into a bath of chemistry that can contain anywhere from 50 liters to more than 150 liters and the excess chemistry is squeezed out to achieve the desired finish pickup. The water is a carrier for the solids of chemistry desired to attach to the fabric.



Traditional



Sustainable

Precise Chemistry Control

The key to the quality improvement and environmental benefit gained by converting to spray technology is that it's non-contact. Precision spray eliminates the need to empty, clean and replenish the pad – changeover – simply to change fabric or chemistry.

Components of a typical spray system from Baldwin include the chemistry supply unit, also known as the pump station, which pumps the chemistry out to the spray unit. It's then controlled by the operator interface, which is programmed for the precise amount of pickup and width and weight of the fabric. The system's algorithms then calculates coverage and controls the spray valves.

The precise amount of “add-on” is applied to the fabric. If the chemical mix is the same from batch to batch, precision spray technology can change the amount of pickup, from 20% for one fabric for instance, to 30% for the fabric behind it. Regardless of the fabric characteristics, it's not necessary to stop the production line.

Any chemistry that is not attached to the fabric is returned and filtered back into the pump station.

Finishing lines that run continuously are more efficient and ensure higher quality. This is true for any production process, whether it's weaving, manufacturing, dyeing or finishing. Uninterrupted production also amounts to substantial savings in chemistry, water and energy.



Zero Chemical Waste in Changeovers

After the chemistries are unloaded, the system goes through a cleaning cycle that circulates hot water through the spray lines, valves and reservoir tank that holds the chemistry and is then ready for the reloading of the new chemistry. This total changeover process only takes about three minutes.

Chemistry can range from softeners, anti-microbials, DWR (C6 and C0), flame retardants, wicking agents, and more, for fabrics such as knitted and woven and for single or dual-side applications.

Traditional padding color change takes on average 10 minutes and can waste up to 50 to 150 liters of chemistry. With precision spray technology color change, there are zero minutes of production time loss and virtually zero liters of chemistry loss.

Loading chemistry 2



Single or Dual-side Application

While pad application is a tried-and-true technology in finishing applications, there are some scenarios where chemistry is not required all the way through the fabric. And in some, chemistries are required only on the face or skin-side of the fabric.

Precision non-contact spray allows for single-side application where it is not only unnecessary, but also not desired, to coat both sides of the fabric. An example of single-side coating being an optimal solution is performance fabrics that require DWR on one side and wicking on the other or latex back coating and polymerization.

With single-side finishing, a lower percent pickup application allows for a single pass when back-coating (wet-on-dry) is required, versus the conventional pad method, which is a two-pass process and an inefficient use of equipment and energy.

Applying chemistry with spray technology allows the finisher to increase the mix concentration and reduce the percent pickup, resulting in 15% to 20% drier fabrics (wet on wet) and 50+% drier fabrics (wet-on-dry) entering the stenter frame, resulting in significantly lower drying temperatures and energy savings and much higher process speeds.

Key to the benefits of contact-free application of finishing chemistry that enables the saving of chemistry, energy, water used in production and wastewater is the ability to finish different color fabrics, one behind another, uninterrupted.

Production can start with a blue fabric, switch to a yellow and then go to a red, for instance, with chemistries continually spraying, with no need to stop. Any chemistry that does not attach to the fabric is brought back into the pump station and filtered and re-used, so there's no contamination.

On occasion, when there is a need to change over to a flame retardant or softener, for example, precision spray technology makes the switch quickly and automatically. The operator simply uses the touchscreen HMI to signal the chemistry change. The system then cycles all of the chemistry that is in the system into the filter and then into the reservoir tank. Less than five liters of chemistry is removed from the system that can be recovered and used at a later time.

Or, if the mill decides to dispose of the chemistry, it's a significantly smaller amount compared to the average 50 to 150 liters wasted with the pad method.

How Precision Spray Increases Productivity



A mill that's changing chemistry constantly can be up to 50% more efficient and achieve perfect quality for its customers with precision spray.

Assuming three changes per day at a factory working six days per week, 24 hours a day, 50 weeks per year, for a total of 7,200 production hours per year, that's a total of 900 changes per year. That's using a diluted chemistry cost of 50% per liter and 100 liters at a cost of \$50 per change.

Durable water repellants and anti-microbials are very expensive compared to softeners. Additionally, increasingly tighter municipality waste water regulations are making it more costly if not impossible to dispose of textile waste water.

With this example, 50% per liter, 100 liters per change, and \$50 per change, 900 changes per year amounts to \$45,000 in chemistry waste and a total of 150 production hours lost to changeovers. Basically, one week's production is lost. Or the mill can reap a 2% efficiency gain in finishing with precision spray.



Large-scale Saving Opportunities

When the finishing range is stopped for changes, the stenter frame must maintain its target temperatures, so all of that energy is wasted. That's a tremendous amount of lost energy on an annual basis.

What kind of savings, or what kind of cost would that be for the company? For wet-on-wet producers, the fabric must be wet before it receives the applied chemistry. In the first pad bath, there is simply water and the second bath is where the chemistry is applied.

A certain amount of pickup of moisture is required coming out of the first bath to be able to get the chemistry in the second bath to attach itself and to have proper migration.

For example, if the optimal pickup, or concentration, is around 11% or 12%. But there's a challenge. As the fabric goes through the first bath into the second, contamination is inherent in the process. But more importantly, the process dilutes the concentration of the chemistry.

The Art of Constant Quality

The mills have a couple of ways to deal with issues that accompany a wet-on-wet scenario. One is to target 11% pickup by starting at around 15%, knowing there's a little excess chemistry in the beginning and that as the mill moves through the process, it will drop below the target.

The problem with this method is that whether the mill is running 500 meters or 5,000 kilos of fabric, the amount of softener supplied at the beginning of the batch is going to be different than what's experienced at the end of the batch, and that is not what the brands want to hear.

The importance of the softener, of course, is to give the touch and feel that consumers seek when the garments or home goods are on the rack. After being visually drawn to the product, almost without exception, the second thing consumers do after approaching the rack is touch the fabric. Softener definitely comes into the equation and consistency is key.

This is an important consideration not only for the end use of the fabric, but also in processing. Softeners are used for lubrication, in downstream processing, so it's extremely important to have a consistent amount of softener from the beginning to the end of the batch.

Besides adding a bit too much concentration and letting it work its way down, the other method is during the production run to continuously add to the concentration, which, of course, is a waste of chemistry.





The Advantage of Total Chemistry Control

The precision spray system replaces the second pad bath. The chemistry has not changed, but the concentration can be increased to make the fabric drier. But instead of going into the second bath, the chemistry is sprayed on both sides of the fabric. The spray nozzles do not touch the fabric, so they are not affected by the water coming out of the first pad bath. The target is set for 11% and remains at 11% from the beginning of the batch, all the way to the end of the batch.

As more consumers shop online, consistency is even more important in the products that brands sell because more and more of their customers are deciding not to go into the store. They want to know exactly what they're going to get upfront, and the only way to ensure that is to have a consistent quality fabric from the beginning to the end of the process.

BALDWIN®

Wet-On-Dry Applications

Back Coating Solved!



With wet-on-wet finishing, fabric goes into a bath of water before it is steeped in the chemistry bath to get the proper application. With wet-on-dry applications, the fabric is dry when it goes either into the pad or into the spray system. With a precision spray system, it can be up to 50% drier going into the finishing range than with a traditional pad.

This allows significant reduction in the amount of heat in your stenter frame, or a higher process speed, depending on the application where chemistry is needed on the fabric's face.

To apply DWR on the face, for example, and another chemistry on the back, with the traditional method, the first application is to dip the fabric into the pad and squeeze out the excess chemistry. The fabric then passes through the stenter frame to dry.

Some manufacturers prefer this to be a single-pass application by applying the DWR and then pre-drying the fabric with heated cans to try to draw down the moisture acceptable for back coating. The problem with trying to pad chemistry such as DWR and then back coat is that the fabric is too wet. Drying the fabric,

and then bringing it back around again either to the same finishing line, or perhaps a second finishing line wastes energy to apply these two chemistries onto the fabric.

Precision spray solves the problem of a two-pass coating process. The DWR is only being sprayed on one side because that's the only place the water repellent or soil-release chemistry is needed. And it's applied to fabric that's dry enough to allow back coating in the same pass requiring only one step for drying and polymerization.

Precision Spray

The biggest savings with precision spray is on wet-on-dry processes, with up to 50% drier fabrics entering the stenter frame. These drier fabrics allow for higher production speed and lower energy requirements, depending on the chemical application. All of the chemistry is filtered and recycled back into the pump station for virtually zero waste.

TexCoat's energy consumption is no more than 10 amps compared to the power consumption of a typical pad of 3 to 5 KVA.

The electricity savings alone from switching to precision spray will not pay for the system, but the cost is reduced to a few hundred dollars per year versus several thousand dollars running a pad system. And certainly the savings on chemistry, electricity from the pad, electricity from the stenter, gas from the stenter and additional productivity all are part of a very strong ROI calculation that will allow mills to achieve the sustainability results they seek, and at the same time, pay for itself.

Baldwin has deep roots in the printing industry and TexCoat is an evolution that segued its technology into textiles with its first TexCoat system installed in Milan in 2015. Since then, the company has installed more than 80 systems globally, 98% of which have been retrofits. Even during the pandemic, Baldwin installed six precision spray systems in 60 days around the world. Baldwin has a global network of service centers, as well as partner agencies with factory trained technicians.

Sustainable Finishing

100% of the
chemistry
recycled

Up to 50%
wet pick-up
reduction

Up to 50%
energy
reduction

Up to 50% water
reduction





For more information visit: www.baldwintech.com

Baldwin Technology Company Inc. is a leading global manufacturer and supplier of innovative process- automation equipment, parts, service and consumables for the printing, packaging, textile, plastic film extrusion and corrugated industries.

As a total solutions provider, Baldwin offers our customers a broad range of market-leading technologies, with a focus on improving the economic and environmental efficiency of production processes. Through a global footprint of 21 company-owned locations and an extensive network of partners, our customers are supported globally, regionally and locally by dedicated sales and service team members who add value by forming long-term relationships. Baldwin is privately owned by BW Forsyth Partners, a Barry-Wehmler company.

BALDWIN[®]
Unlocking Your Potential