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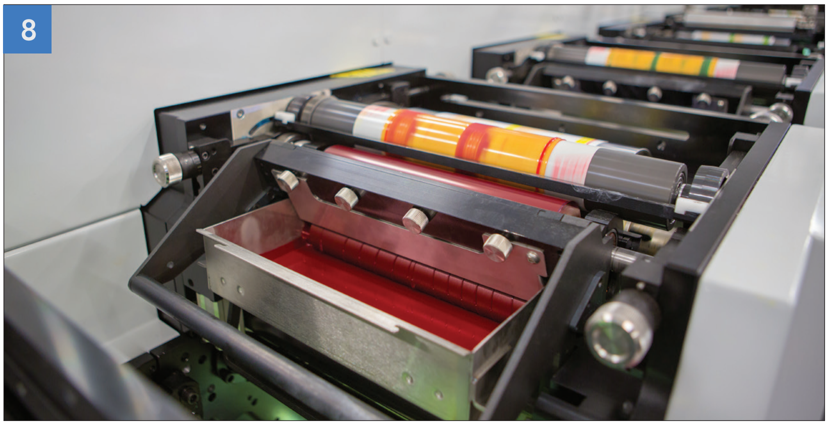

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Rust to Tech: Part II

By **Susan Stansbury**, Contributing Writer

This is Part II in a 5-part series. It began with a look at the rust belt image, concentrating on mills making substrates and related converting. Part II is a snapshot of converting examples with associated suppliers and technologies. With the reminder that converting operations add value to roll goods substrates, here are some of the elements. Additionally, it's notable that converting, from start to finished product, often involves several steps at one or multiple companies.

Slitting & Winding

This would seem to be the most basic, simple aspect of converting. However, there is a range of capabilities with increasing precision among converters. Some companies can convert extra-wide mill rolls; some cut unusually small ones; diameters provided range from jumbo to tiny—all depending on customer requirements. Some converters who slit and wind rolls combine this step with others such as multiple layering or moving the material directly into other transformations such as flexo printing, coating and laminating. Improved precision in slitting and winding cuts waste and increases productivity.

Throughout the converting processing world, there is increased automation for quality, reliability and relief when it's difficult to recruit workers. "Automation and ERP (Enterprise Resource Planning) are among the latest technology focus in converting where tagging and coding every plant location and piece of equipment allows us to scan and track raw materials and finished goods at every step," says John Michaud, an owner at American Custom Converting (ACC), Green Bay, WI. "It lets know how far along the job is, where waste is occurring and whether we made a profit on that shipment."

Paper rolls in a touch-screen era, courtesy Wisconsin Paper Council.

ACC is investing in automated roll handling to increase speed of roll packaging and in small roll rewinding for customer needs of wide (130") but small diameter (4"–20" OD's)/length as little as 20 feet, with/without a core.

Numerous companies support web handling upgrades at converters. Center surface winding specialists include Associated Machine Design; Atlas Converting's slitter-winder technology supports the packaging industry; Chase Machine and Engineering touts its 3-D modeling for unwinds-rewinds-slitters while integrating ultrasonics, glue dispensing and thermal bonding.

Bringing new technologies to converting, even when retrofitting equipment are companies like Midwest Engineered Systems where they build new and update converting systems. Retrofitted automation systems, integrated motors and controls are the focus of Quad Plus. Modular Web Solutions offers flexibility; Motion Controls Robotics brings the latest automation that connect production to the front office interfacing with ERP solutions.

Drying

The evolution of paper, substrates and converting into higher technologies improve everything from throughput to energy reduction. Processes often use dryer ovens or infrared drying. Today, many have gone from decades-old traditional

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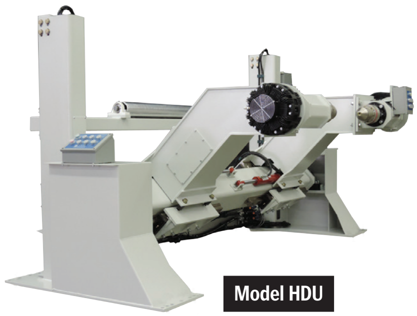

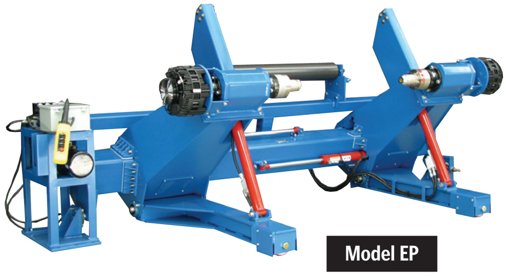

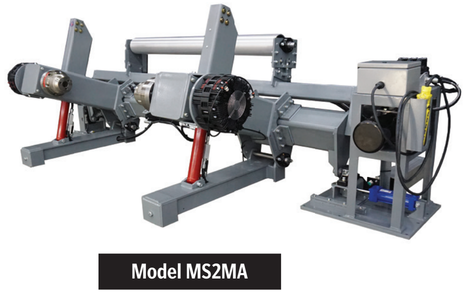

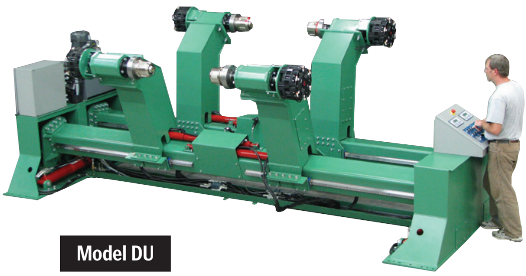

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equipment to technologies such as a fresh new look at infrared drying. According to Dave Wurtz, CEM, a consulting engineer with Greenervation, LLC which is an agent for Compact Engineering, "Compact's drying solutions include precision design and manufacture of IR lamps that emit IR in a very narrow bandwidth of the IR spectrum, namely in the 1.35-to-2.5-micron range. This precise range of IR penetrates deep into the sheet creating a positive vapor pressure causing rapid drying. In fact, this drying is so rapid that the evaporation causes a cooling effect with the substrate being cooler leaving the dryer than it was before entering, thus protecting often heat sensitive substrates."

Compact's dryers remove twice the water per installed KW when compared to traditional IR, using half the energy and needing less real estate on the machine which is often at a premium. Compact dryers are designed around machine speed and width, with modular options. It's a technology that's well suited for paper, nonwovens, coating, laminating, flexible packaging, cold seal and other adhesives and flexographic printing."

Adhesives and Laminates

Part of technology upgrades involves looking at other competing options. For example, Patrick Kellogg of Savare Specialty Adhesives North America explains that switching from water-based adhesives to hot melt in assembly lines cuts waste and has better turnaround times. "There is no drying or cure time," he says, "and for layered materials, it's an ideal approach." Applications also include foam-to-foam bonding, tapes and pressure-sensitive labels.

Companies like Sierra Coating Technologies work with coatings and laminating expertise using paper, poly and nonwovens to produce "Super Material ™". Mid South Extrusion produces polyethylene films in mono and multi-layered structures for printing and converting. Eight-color printing, plus laminating for roll stock, bags and pouches requires converting complexity by Fredman Bag Company.

Next: Part III will cover some of the latest converting technologies with an emphasis on their associated markets. ■

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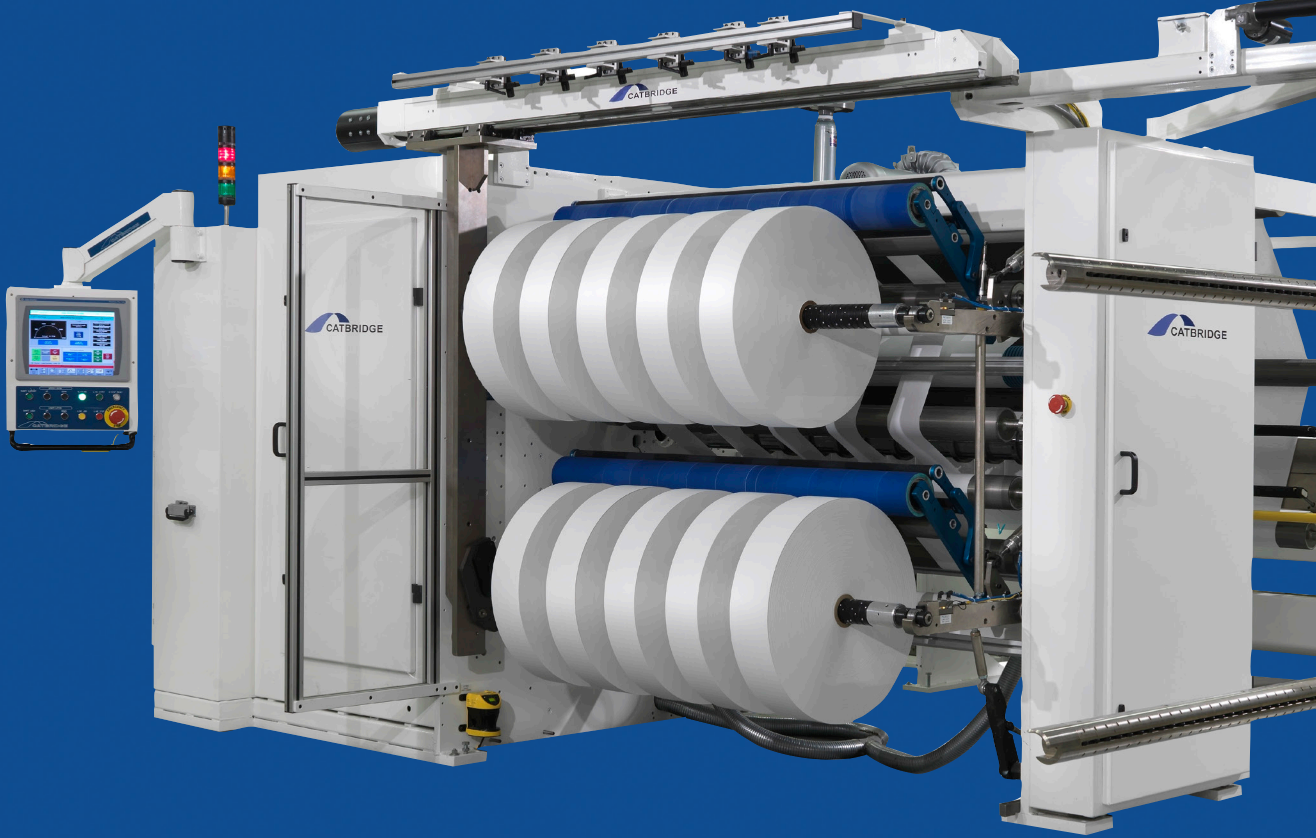

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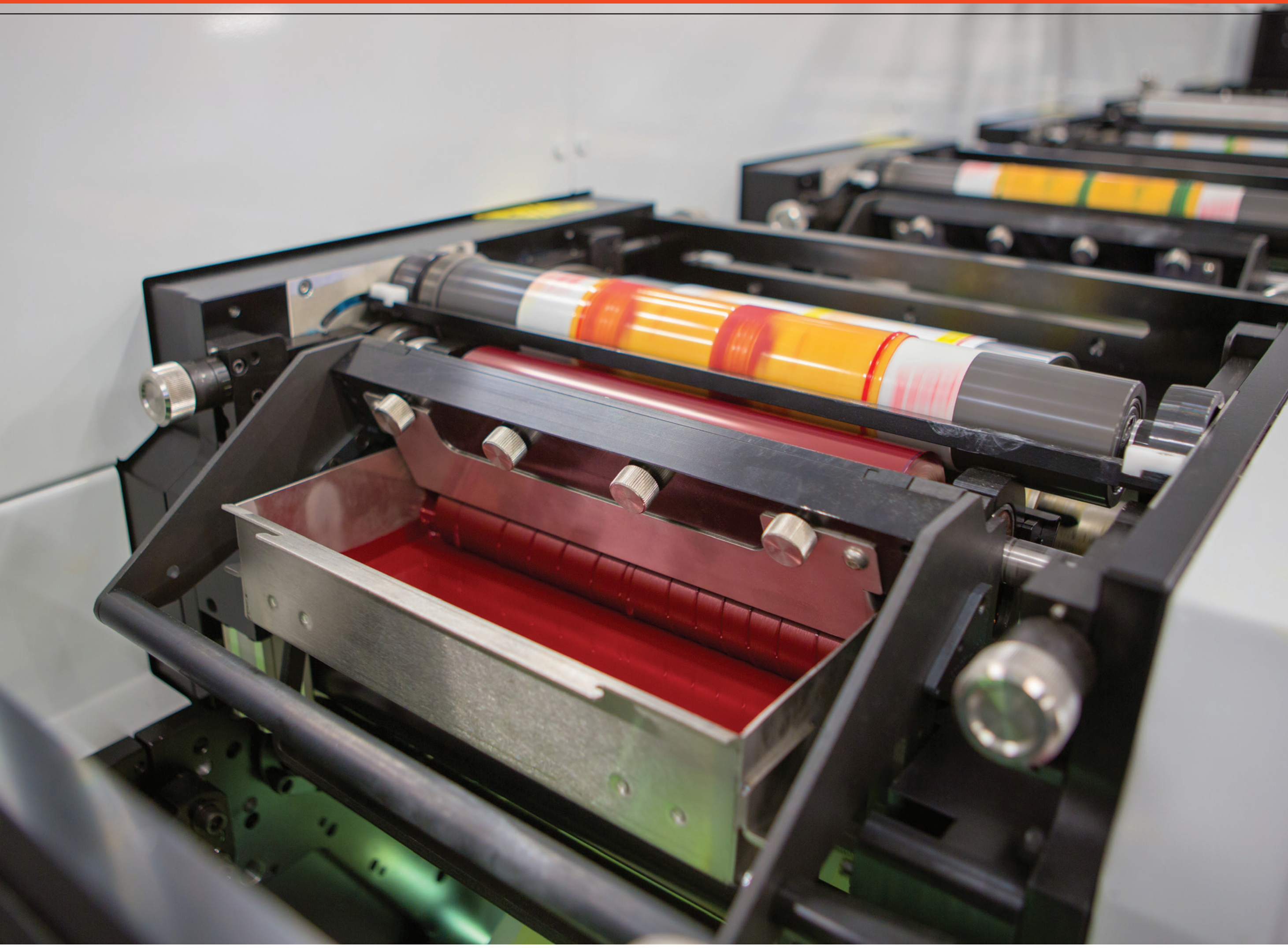

A Guide to Selecting the Optimal Water-Based Primer for Extrusion Coating and Extrusion Lamination Applications

By **Jessi Spadaccino**, Communications Manager at Mica Corporation

When trying to manufacture structures with multiple layers, a chemical primer is usually needed to improve bonds between a substrate and a coating, such as an extrudate, or ink. Primers can also help to enhance barrier properties, aesthetics, and overall performance of the finished structure. Water-based primers are a common choice because they provide superior performance on a vast array of substrates and are generally a safer and more sustainable choice compared to solvent-based primers. However, not all water-based primers are created equally. There are several factors to consider when choosing the appropriate primer for your application.

1. What process are you using?

Water-based primers are typically used in the manufacture of multilayer structures in one of two processes: extrusion lamination or extrusion coating. The way in which you are manufacturing your structure and the materials that

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are used in that process will be important factors in the primer selection process.

2. What is the end-use application?

To determine the type of primer needed, you should consider the product's end-use and the exposures that the product needs to withstand during its lifecycle. For example, if you are interested in creating a commercially compostable structure, it is important to ensure that all materials in the structure, including the primer, can offer all the requirements for performance and compostability at the end of its life. Also, if the end-use application is a package or container, something else to consider is what it is being designed to protect. For example, contents that are oily will need different containment properties than a package holding dry or dehydrated ingredients.

> **To determine the type of primer needed, you should consider the product's end-use and the exposures that the product needs to withstand during its lifecycle.**

3. What is the structure and where will the primer be used?

A wide variety of chemistries, processes, and raw materials are used to create primers. Knowing the target bond strengths and/or bond requirements, and the specific substrates and/or extrudates you need to adhere will be paramount in determining the correct type of primer for your application. Some primers can also offer barrier, surface modification, or other properties in addition to adhesion depending on where it will be used in the structure. Understanding the benefits and limitations of the materials you are working with will help you better understand the properties your primer needs to provide.

4. What are the regulatory requirements needed for this application?

Will the primer have direct or indirect contact with food? Do all the materials in the structure need to be REACH registered, Halal certified, or free of Substances of Very High Concern and/or Prop 65 components. Be sure to verify that the primer you choose has all the regulatory requirements you need prior to finalizing your selection.

5. What is the application method?

How will you apply the primer? Application methods may vary depending on the process and materials used. The primer recommendation may change depending on whether the application method is via smooth roll, gravure cylinder, Meyer rod, spray coating, or a flexographic printing press. Also, knowing whether the primer will be applied inline or offline may also play a part in your primer selection. For example, if you are applying primer offline on film, and the film is then rolled up and stored until it is ready to be used in the next step of the converting process, a non-blocking primer will be needed so that the primer does not transfer or adhere to the other side of the rolled substrate.

6. Do you need any technical support?

There are many complexities that need to be addressed when working with water-based primers. Water-based primers usually require pre-treatment prior to application and need to be adequately dried to ensure optimal bond strength. Line speeds, time in the air gap, and dilution formulas as applicator rolls wear all need to be monitored and adjusted regularly, too. Understanding the level of technical support you need, and what your primer supplier can provide, is paramount to ensuring long-term success. ■

Expansions and New Markets for Nonwovens

Rolls of carded spunlace created from sustainable fibers such as viscose and lyocell.
Courtesy of Suominen

The Association of the Nonwoven Fabrics Industry (INDA), serves hundreds of member companies in the nonwovens/engineered fabrics industry globally. Since 1968, INDA networking events have helped members connect, innovate and develop businesses. With such an extensive background and expertise in nonwovens, PFFC talked exclusively with INDA's Brad Kalil, director of market intelligence and economic insights, and Chris Plotz, director of education and technical affairs for insights on current obstacles, solutions, and other trends in nonwovens. Here is what they had to say:

What steps are nonwoven material producers taking to recover and restore the supply chain after COVID 19 disruptions?

Kalil: It depends upon the nonwoven material producer, not only in the type of material—as there are four forming methods, multiple bonding methods, and dozens of raw materials used—but also the end use market the nonwoven producer supplies.

Some supply chains were barely disrupted—as the majority of nonwoven tend to stay where they are produced—while others may have been impacted by the availability of raw material. More importantly, was the end use market served.

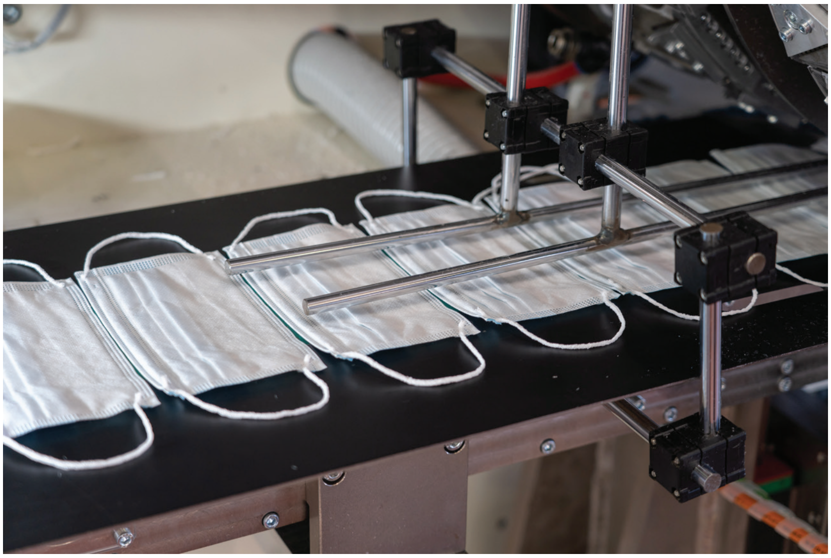
Brad Kalil
Director of market intelligence and economic insights at INDA

Chris Plotz
Director of education and technical affairs at INDA

Some markets—notable vehicle and building construction—were shut-down during the pandemic, and still to this day those markets are impacted by their own supply chain issues, resulting in many nonwoven producers with material but no market. Other markets—notably protective medical apparel, wipes, and face mask/respirators—were running full-out. Other supply chain issues, such as transportation issues and workforce challenges continue to challenge all manufacturers.

What are some new markets increasing their usage of nonwoven material?

Photo courtesy of Suominen



Finished surgical face masks ready for visual inspection and then packaging.
Courtesy of Andritz

Kalil: As published in INDA and EDANA's recently released Global Nonwoven Markets Report, A Comprehensive Survey and Outlook, 2020–2025, the three fastest growing markets, in average annual growth rate by weight, from 2021 through 2025 are geosynthetics, filtration, and vehicle construction.

The geosynthetics market is primarily driven by the strength of the economy, which has the biggest impact relating to the expansion of private infrastructure and buildings, and the government, be it through spending on public buildings, infrastructure, legislation or regulation.

Further, the global geosynthetics market growth is driven by their increased adoption in a variety of applications in the construction sector, and the emergence of these as viable alternatives in waste and water applications has further bolstered global geosynthetics market growth.

Moreover, an increasing number of infrastructure development projects in developing countries—notably China's Belt and Road Initiative—are increasingly specifying the use of geosynthetics in roadways and rail construction applications.

There are numerous drivers affecting nonwoven filter media demand, though the over-arching global megatrend would be the demands for purer air and cleaner water, which are both the subjects of ever-more stringent legislation. The market for nonwovens in filtration media is also growing—due to nonwoven media being more economical and better performing—by taking share from woven and paper-based filter media.

A significant boost to the air filtration markets will be the coronavirus-related mitigation efforts. Consumer and workplace health and safety is creating new filtration needs, and is raising the bar on performance. The assumption is that the filtration industry will be able to deliver the needed filters and masks. The air pollution prevention benefits of masks, HVAC filters, and dust collectors are also greater due to the steady increase in wildfires. Concerns that media manufacturers have about building capacity which will go unused after a vaccine is perfected is somewhat unwarranted. Not only are there non-mask uses but air pollution, indoor pollution, wildfires, and new viruses will boost mask demand.

Nonwovens have proven themselves versatile in the transportation sector, saving resources and making vehicles quieter, lighter and more comfortable. Nonwoven composites are now being used to replace parts previously made of metal, in addition to replacing plastic parts. The key benefit of the composite components is their light weight; they can also be molded and produced with special surface finishes and other features. In addition, nonwoven materials can be made for sustainable material and some offer the ability of being recyclable. The transportation market is primarily driven by the economy and by vehicle producers requiring lighter weight and better performing materials. Passenger vehicles have seen rapid evolution over the last few decades with an increasing focus on comfort, convenience, safety and the quality of the driver and passenger experience. Tactile pleasure and aesthetics, which were once the preserve of luxury vehicles, are now a basic requirement for every model. Superior silencing materials are required to enhance comfort in the car interior, which contributes to general well-being and safer, more relaxed driving. Meanwhile, higher engine temperatures and pressures place extra demands on silencing and sealing components.

In terms of totally new mar-

Nonwovens are used to stabilize railroad tracks.

kets, there are few, as nonwovens are already in thousands of end-use products. Nonwovens are increasing share in some markets, such as wallpaper. Nonwoven wallpaper has increasingly become more popular throughout the developed markets, especially as a replacement for paper- or vinyl-based wallpaper during renovation of existing residential properties. Furthermore, nonwovens are increasingly the product of choice for wallpaper installers and design professionals.

Where has there been a global increase of production of nonwoven material in the last 3 years?

Kalil: China. In the last five years (2016–2020), global nonwoven production increased 5.2 million tonnes. China accounted for 60% of the production growth, North America 17%, and Greater Europe (including Turkey) 10%. New investments from abroad and domestic development made this growth in China possible. Indeed, domestic Chinese nonwoven enterprises have improved dramatically, and several have entered the global top 40 nonwovens businesses. Concurrently Chinese exports exploded;

they overtook one million tonnes already in 2019 and they reached 1.4 million tonnes in 2020.

What are recent advancements in sustainability for nonwovens that you feel more people need to know about?

Plotz: For starters, application scenarios. The promise of biofibers is both the preservation of natural resources with a focus on renewable raw materials. Biodegradable polymers have offered scientists a possible solution to waste-disposal problems associated with traditional petroleum-derived plastics that are difficult to recycle and/or repurpose. The continuing challenge remains in finding applications which would consume sufficiently large quantities of these materials to lead price reduction, allowing biodegradable polymers to compete economically in the market due to scale. Traditional polymer fibers have a significant advantage of time and resources to evolve. Biofibers both mimic naturally occurring fibers and are constructed from materials that either do the same or use natural analogues for their output.

And second, how do biofibers play from an environmental/sustainability perspective? Are all biofibers environmentally friendly? Biofibers typically have a preferred life cycle from an environmental and sustainability perspective. This includes sourcing, manufacturing, use and end of life. This becomes a complicated question to answer because there are many key performance indicators in each aspect of the life cycle. Two of the most often considered are greenhouse gas emissions in production and end-of-life and nature resource usage, primarily water as it is typically required for both irrigation and process. Both of these metrics are lower than conventional non-biofiber products. The outlier metrics are environmental biodegradability and cost which biofibers are – have high marks for both. Biofibers typically break down in natural conditions but cost much more due to scale.

What are recent advancements in nonwoven machinery/technology/automation, and how can they benefit those who produce nonwovens?

Plotz: The ANDRITZ Wetlace™ technology is an ideal process for the production of flushable/dispersible wipes from 100 percent natural and/or renewable raw materials without chemical binders. In addition, fabrics produced using this innovative process comply with the latest EDANA/INDA flushability standards, passing all seven tests according to the new guidelines.

The ANDRITZ Wetlace technology combines wetlaid inclined wire forming and hydroentanglement. The fiber processing during stock preparation, fiber lay-down during wet forming, and mechanical bonding with hydroentanglement have been perfectly designed to optimize the wet strength of wipes for use and fast disintegration when flushed. Moreover, the ANDRITZ Wetlace technology has the added benefit of using a blend of fibers (wood pulp and short-cut cellulosic staple fibers) without chemical additives or binders so that they are completely biodegradable.

INDA recently announced the finalists for the RISE Innovation Award. What stood out most with this year's entries? How does this award help promote and spotlight creators in the nonwoven industry?

Plotz: These submissions were very diverse from materials to finished products. Many of the submissions were PPE based to serve as pandemic solutions.

What future developments do you see for the use of nonwovens in the flexible packaging industry?

Plotz: There are two areas that continue to gain traction for nonwovens in the flexible packaging industry: grocery/shopping bags and protection/sterilization materials. Bags are an interesting end product because they displace single use products i.e. plastic grocery bags. Film based bags are becoming banned in many locations and nonwovens are starting to fill the need. New materials are being developed to increase speed and safety in medical packaging applications in which ETO (Ethylene Oxide gas) sterilization is utilized. ■

The Discovery, Development of Glitter

From chips on shop floor to sparkles and smiles around the planet

Contributed by **Robert Seeley**, Industrial Writer, and **Henry W. Ruschmann**, Glitter Expert

Glitter – Everyone knows the look of these sparkly chips of film and foil that appear worldwide bringing smiles and adding sales appeal for packaging and products. It appears universally in packaging, cosmetics, auto and boat finishes, building supplies, fashion garments, toys, greeting cards, aerosol paints – and many other applications.

We might not know that modern glitter was invented and developed by Henry F. Ruschmann, a German immigrant who arrived in New York on the MS Bremen in 1926 and was hired, right at the pier, as a machinist by the Westinghouse Company, Irvington, NJ. (The captain of the ship had recognized his skills as an excellent machinist and wrote him a letter of recommendation.)

Based on his precision cutting of photo paper, film and foils, this machinist, toolmaker, inventor, entrepreneur, and immigrant triumphed in attaining his American dream.

Origins and growth of glitter

The origins date to the late 1930s when Mr. Ruschmann partnered with Harry Goetz in the firm Goetz and Ruschmann in Maplewood, NJ, precision cutters of paper and film and developers and printers of photographic film for Kodak and Ansco. Ruschmann invented and patented a high-speed machine that cut apart the developed glossy photo prints in roll form that consumers snapped with the familiar old Kodak Brownie box cameras. The cutting inscribed a grooved (deckle) edge for the consumer to tear photos from the small booklet into which the prints were clipped.

German immigrant Henry F. Ruschmann arrived in New York on the MS Bremen in 1926 to pursue his American dream.

The cutting machine occasionally "stuttered", depositing glossy cellulose/paper "schnibbles" on the shop floor – until some employees got the idea of taking them home and using them as "snow" in Christmas decorations. Thus was born the concept of glitter, which evolved into today's universal applications.

Goetz and Ruschmann, under government contracts, also cut mica into washers – and cut metallized cellulose acetate roll film from which sequins had been punched. Mr. Ruschmann invented a machine to reduce the sequin scrap into ca. 1 mm square glitter schnibbles.

The first glitter factory

The precision cutting of glossy photo prints, mica and other projects generated healthy income for the partners, allowing Mr. Ruschmann to purchase Meadowbrook Farm in Bernardsville, NJ in 1943.

In 1948 he moved a small developmental machine from the Maplewood shop into the family home at Meadowbrook Farm to cut glitter schnibbles from plastic scrap. The cuttings would help pay the farm's operating expenses in raising pure bred guernsey cows and producing milk. The same year, Ruschmann established Meadowbrook Farm Inventions (MFI) from which would evolve today's multitude of glitter products and applications.

In 1948, MFI produced a modest 80 lb of glitter per day. Year by year, as orders increased, Ruschmann expanded paper, film, foil and glitter cutting operations to his other farm buildings, and built more machines to turn out more product.

Glitter product evolves

Mr. Ruschmann originally called

his sparkly cuttings schnibbles and later Metallic Jewels. The earliest materials were metallized cellulose acetate followed by polished aluminum foil. Over the years more substrates were added including epoxy coated metallized film, polyester, PVC, iridescent films, complex laminations, and others. Materials went to thinner gauge and with better heat, light, weather and solvent resistance.

During the 1960s aluminum foil sheets were down to thicknesses of 0.0008 and 0.00045 in. with polished surfaces. Coatings came in thermoset epoxy and naptha resistant combinations.

New production machines were developed including high-speed, single-cut machines and others that cut micro-sized hexagonal shapes.

Glitter's progress

Shapes, sizes, textural effects, and applications grew steadily. Cuts originally were square but Ruschmann found that a hexagon shape was more pleasing to the eye and left less scrap and waste. For sizes and shapes, a large cut produced a lively, many highlighted surface. A fine cut gave a smooth , satiny sheen. Other shapes included stars, irregulars, slivers, fibers and threads.

Glitter would be applied to metal, wood, paper, fabrics, plastics, inks, paints, other materials. It would be sprayed, knife coated, roller coated, screen printed, rotogravure printed, cast, extruded, injection molded, laminated or incorporated in basic raw materials.

During the 1960s, son Henry W. Ruschmann joined Meadowbrook Inventions, working his way up to COO in charge of product development, purchasing, and sales. He instituted quality control to assure batch-to-batch uniformity in brightness, size, shape, dimensions.

Meadowbrook Inventions built its own shaker screeners, which made two cuts – on-size and rejects – from the high-speed precision-cut glitter chips.

Glitter was selling worldwide. During the early 1960s Meadowbrook was averaging 2-1/2 tons of glitter per day, and by the 1970s five tons per day.

Glitter's many uses

The first industrial uses were greeting cards, followed by raised printing and screen printing. Fiberglass motorboat hulls and Christmas tree balls followed soon after. In addition to motorboat hulls and automotive finishes, glitter would be mixed into cosmetics, fishing lures, inks, plastics, fiberglass, flooring, ceilings, countertops, tile, wallpaper, clothing, toys, arts and crafts, toothpaste, packaging, and laminated sheeting for labels and decals.

Holographic glitter was developed in 1967 by Henry W. Ruschmann. It embosses a diffraction grating (hologram) onto the film to reflect different colors of light in different directions, producing a rainbow effect. Holographic glitter is found in security applications such as credit cards, passports, and even some countries' paper currency. Most common uses are cosmetics and holiday packaging.

He also developed the first holographic glitter laminations with metallized cellulose acetate and later polyester as the substrates, which can biodegrade. The future sees a push to produce biodegradable glitter to meet environmental objections to PVC substrates.

Today, glitter is a worldwide commodity product with boundless applications. Over 20,000 varieties are manufactured by multiple firms worldwide in different colors, sizes, and materials. One estimate suggests that 10 million pounds of glitter was either purchased or produced between the years of 1989 and 2009.

The Henry F. and Henry W. Ruschmann inventions and development of modern glitter keep putting smiles on faces around the world, fulfilling a life's desire to "Leave this earth a little better than when you found it." As important as the sparkles from glitter, they also fulfilled a desire for the family to always enjoy their bucolic Meadowbrook Farm in Bernardsville, NJ. ■

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