

Technical **TEXTILES** international

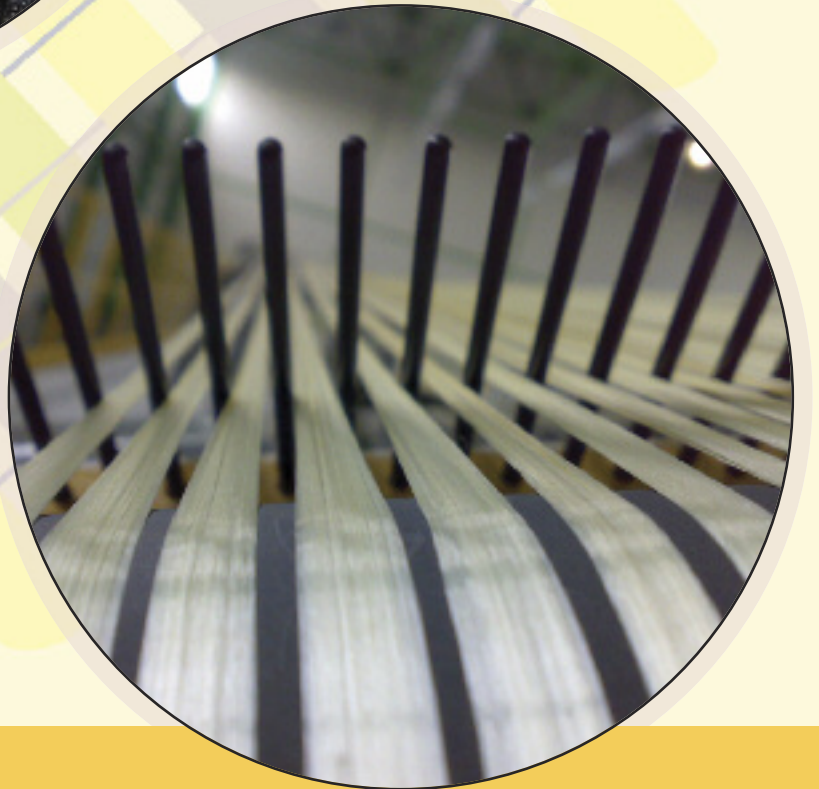
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Informing the industry worldwide



The industry's
life-saving response to
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Apex Mills explores the potential of trailblazing knitting technology

Specialising in state-of-the-art knitted technical textiles currently offers incredible challenges as well as numerous opportunities. As competitors fail, for instance, manufacturers can acquire new capabilities and new customers. One such company, reports John McCurry, is Apex Mills, which made its first acquisition in 2019.

With headquarters in Inwood, New York, USA, close to JFK International Airport, Apex Mills is a specialist manufacturer of warp knits, which in 2019 acquired compatriot Macra Lace, a producer of lace and speciality warp knits. Located in Oxford, the now renamed MakTech Textiles is just 60 miles from Apex Mills' manufacturing facility in Graham, both in North Carolina. Jonathan Kurz, Apex Mills' President and Chief Executive Officer (CEO; see also, page 28), as well as being the son of founder Milton A. Kurz, says MakTech Textiles was acquired to broaden the manufacturing operations:

- MakTech Textiles contributes dyeing and finishing capabilities that Apex Mills had previously outsourced;
- the acquisition also brought-in knitting machines that broaden the new parent's design capabilities and fabric portfolio.

The Oxford plant can now handle most of Apex Mills' dyeing and finishing requirements, allowing the company direct control over the entire manufacturing process, from concept to finished textile.

The acquisition included 18 high-speed raschel machines (Rascheltronic from Karl Mayer of Obertshausen, Germany; see also, page 4 and page 9) for producing, for instance, jacquard-patterned, stretchable and non-stretchable fabrics. These machines have prompted Kurz to dream of producing sophisticated electronic textiles (e-textiles): "For example, we would love to come-up with a keyboard that you wear on your arm. It's not achievable right now, but these machines offer that type of opportunity"

Kurz says that the Rascheltronic machines can manipulate conductive yarns to form integrated patterns that can be used as buttons, potentially an array of buttons that in combination create a unique keyboard configuration. In spacer constructions, the design of the pattern also allows for a cushioned feedback that can be combined with piezoelectric



As part of its purchase of MakTech Textiles, Apex Mills acquired 18 fine-gauge Rascheltronic machines. The company is now exploring the potential of these to develop a broad portfolio of high-performance fabrics.

functionality. This is a fast method of making e-textiles, and one that allows for subsequent cutting and sewing of the fabric without breaking the circuits.

The fine-gauge Rascheltronic machines at MakTech Textiles are also well-suited to producing several patterns within a single fabric (a so-called "body-mapped" fabric⁽¹⁾) allowing engineers to apply different designs to specific areas, such as stretchable and non-stretchable regions, and highly breathable meshes, combining them in order to satisfy the various requirements of customer.

Clelia Parisi, a member of Apex Mills' Business and Product Development team, joined the company as part of the MakTech Textiles acquisition. She describes the expansion in Apex Mills' manufacturing capabilities for warp knits as a result of the acquired machinery as dramatic. The production machinery at MakTech Textiles is so versatile that now, when company representatives describe the latest possibilities, customers have a high degree of disbelief: "This is design they didn't even know was possible."



Great market potential

Used in medical devices (such as orthopaedic products), military, safety and protection, and automotive applications, as well as shoes, golf bags, apparel and high fashion, spacer fabrics offer the greatest potential, according to Apex Mills' management. Kurz adds that it is the first manufacturer in the USA that can simultaneously apply functional patterns to both sides of a spacer fabric.

Spacer fabrics with built-in touch sensors also have bright futures. Apex Mills co-owns a patent with Drexel University of Philadelphia, Pennsylvania, USA, for instance, that could result in the manufacture of fabrics containing integrated remote controls. These textiles can be cleaned and wiped, and used to upholster the armrests of chairs and sofas. Other applications for this type of sensor will be found in the medical and automotive industries.

The patent is for a capacitive touch sensor embedded in a warp-knit fabric, although the team at Drexel University had originally patented a design for weft-knitted fabrics. With the principal goals of scaling-up the production and commercialising the technology, in 2017, Apex Mills started working with the Pennsylvania Fabric Discovery Center and the Center for Functional Fabrics, both at Drexel University, via its involvement with Advanced Functional Fabrics of America (AFFOA)⁽²⁾ of Cambridge, Massachusetts, USA.



A family concern: Apex Mills' President and Chief Executive Officer, Jonathan Kurz (above; see also, page 27), is the son of its founder, Milton A. Kurz.

The company further plans to collaborate on projects, including some via AFFOA.

Stephanie Rodgers, Director of Advanced Product Development, says the company wants to exploit science and innovation. There are other methods of making electronic circuits with textiles that can provide other functionalities, such as heating and lighting, and Apex Mills wants to exploit these by getting designers and

manufacturers to change their way of thinking about products, she says.

Another fabric in development, for instance, is intended to provide wireless power transfer to a mobile (cellular) telephone. Exploiting electromagnetic induction, the fabric will be able to charge a device set down on it, as is the case with existing pads made from rigid materials.

Seeking to develop textiles that offer health and well-being benefits to their users, meanwhile, the company has explored several methods for incorporating natural extracts and minerals, as well as cannabidiol (CBD). The additives are integrated into yarns or applied as topical treatments. "Our goal is to provide the highest level of wellness performance for intimates, home textiles and therapy products," adds Rodgers.

Kurz and his management team see the potential of functional fabrics as the company's biggest opportunity and are looking to exploit Apex Mills' relatively small size and nimbleness to react quickly to the market's demands. Through its collaborative research, the company is also seeking to discover more about the functional attributes that warp knits can provide, an approach that is aided by the diverse range of fabric types and gauges it is able to make. Many of these projects are confidential and involve a great deal of intellectual property (IP).

Existing markets

Apex Mills already serves a diverse array of markets, the largest of which continues to be the automotive industry. Another major one is contract furniture, where its meshes and spacer fabrics are used in office chairs and privacy panels.

Other important sales are made to the military, safety and protection, medical, industrial and aerospace sectors. For the military, for instance, Apex Mills makes fabrics that troops can drape over buildings to provide protection from the shrapnel generated by bomb blasts. Its fabrics are also used in microscopic surgical procedures, such as in biopsies where a tiny retrieval net is used to gather samples for subsequent testing, and it supplies insulation for spacecraft.

A recent development is a body-mapped fabric that provides venting in strategic areas of garments worn by



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those involved in strenuous sports. In the production of the fabric, the process can switch back and forth between mesh and pattern without the need for seams.

Parisi reveals: "We are working with two major active sportswear suppliers." In one example, the company produces a fabric for Under Armour of Baltimore, Maryland, USA, to make sportswear used by some of the basketball players in the US National Collegiate Athletic Association (NCAA) league. The fabric is made using a stretchable fibre (Reflexx) from Unifi Inc⁽³⁾ of Greensboro, North Carolina, USA, and is designed to provide high levels of air-permeability. The next generation of this fabric will be a body-mapped design.

Another fabric for the military is used to make physical-training uniforms that need antimicrobial and moisture-wicking liners. More generally for military applications, "One of the most important things is the weight of the fabric," Rodgers continues. Military personnel need to carry a great deal of equipment on and in their garments without ripping or tearing the fabrics and Apex Mills has become a specialist in developing such textiles.

Creating opportunities

Apex Mills thrives by recognizing fresh opportunities in the many markets it supplies. True to its slogan ("*Problem Shared. Problem Solved*"), it collaborates with hundreds of customers and seeks feedback from retailers to identify potentially new applications suited to its expertise. "The collaborative approach speeds development and eliminates waste," Kurz says.

This approach starts when existing customers explain their requirements and challenges, and how they would like to develop their products, he explains: "Then we start looking into how we can do that. We collaborate with yarn producers and we work with fabric engineers. We also work with product engineers within our partners, learning how the end-product will be used and how the fabric needs to function to allow our team to engineer the best solution."

Based on the customer's specifications, designers at MakTech Textiles sketch the fabric using a computer-aided design (CAD) program and then the company's textile specialists/engineers convert the sketch into machine instructions. During development, Apex Mills'

technicians perform various tests to ensure the textile satisfies the desired specifications.

The company buys all its yarns, but warps them itself and does all the knitting in Graham and Oxford. Its production equipment includes raschel, tricot, spacer, multi-bar, jacquard and double-jacquard machines, a total of about 180, including sample machines used to test products. Greige goods are then dyed and finished in Oxford. The company has its own jet-dyeing, brushing and cutting capacity, but for some fabrics it partners with specialist cutting companies.

While finding qualified labour is a challenge for many US manufacturers, Kurz says that Apex Mills has a committed workforce at its manufacturing facilities in Graham and Oxford. In addition, it boasts an experienced sales force.

Apex Mills is a private company and has been in existence for 80 years. "Started by my father, there is a real family atmosphere here. We take care of the specific needs of people and take into consideration their situations," adds Kurz. Emphasis is put on empowerment and personal growth of the staff.

Adapting to a changing industry

Even before the COVID-19 pandemic, the company was reducing its presence at trade shows, once considered critically important all along the textile supply chain. Kurz notes that, while in the past, companies could return from a trade show with dozens of realistic sales leads, the evolution of e-commerce has lessened the importance of such shows. Nevertheless, industry gatherings continue to offer some value: "they provide us with visibility as a supplier and a chance to explain our capabilities," says Kurz. "Trade shows no longer really generate business directly and we have been scaling-down our presence at them, switching to other channels for exposure."



Director of Advanced Product Development, Stephanie Rodgers, emphasises the company's desire to exploit science and innovation.



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One of those channels has been membership of AFFOA. Apex Mills has been a member for three years, which Kurz describes as a “wonderful experience”. One direct benefit has been the collaboration with the Pennsylvania Fabric Discovery Center, but more broadly, the membership has expanded the company’s research and development (R&D) capabilities significantly. “We [Apex Mills] have expanded our R&D [in terms of the] number of collaborators that we have within a very short period of time,” he adds.

As well as building its network, the company has been exposed to new technologies and a cross-disciplinary group of people with different skills and knowledge, coming together to develop technical textiles through AFFOA. According to Rodgers, Apex Mills works with the Pennsylvania Fabric Discovery Center on projects that are best suited to warp-knitting. The collaboration allows for ideas to be developed in a laboratory environment. During the development phase, the partners share resources and then the company scales-up any discoveries for commercial production.

Future directions

In future, Kurz believes there will be more collaboration in the industry, with textile manufacturers reaching-out to others to help develop the best solutions. This will be particularly important as the industry strives to satisfy the demands of consumers for sustainable manufacturing. Apex Mills is trying to develop its own sustainable practices and products, and “We are reaching-out to learn more,” Kurz notes.

Opportunities for further acquisitions may arise as other mills close and Kurz says he is committed to moving forward and open to acquisitions if they make good business sense. “We are going to take advantage of opportunities when properties or machinery become available.”

Interviewed in late-February before the COVID-19 pandemic hit the USA with full force, Kurz warned of an impending challenge to the supply chain. The industry is heading into a great unknown, he said. As Asian suppliers shut-down, the US industry is going to have to find replacement sources. Nevertheless, he also recognised the opportunities this will create to bring manufacturing back to the USA.

References

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