

Laser Finishing of Textile Materials: Developments at ITMA 2019

Traci A.M. Lamar
Wilson College of Textiles, NC State University
Raleigh, NC, USA

Introduction

Laser effects can recreate manual and chemical effects on textiles without water, solvents or chemicals. This paper focuses on laser systems shown at ITMA 2019 that were designed for textile and product finishing and embellishment. Though these lasers for finishing also commonly have cutting capability, they excel in rapid and flexible distressing and embellishing offering fast and precise engraving and marking effects. Particularly suited to laser treatment of textiles are CO₂ lasers. CO₂ lasers use a mixture of gases such as carbon dioxide, nitrogen, hydrogen, and helium in a mirrored tube. When excited by an electrical current, the gas produces thermal energy which is reflected by the mirrors and intensified producing a beam of laser light from one end of the tube. The laser beam must be directed to the textile surface for laser treatment to occur. To move the laser beam around the material at the speed required to achieve finishing effects, a galvo mechanism is typically used. Galvo systems use motorized, high speed mirrors to direct the laser beam onto the material surface. Because only the motorized mirror is moving during processing, the laser can be directed over the material being treated at very high speeds with great precision. Because the laser head does not physically move, galvo lasers are very fast and efficient systems for distressing and finishing of textiles. Such systems are able to handle cutting and enhancing of single layer fabrics as well as the aging and distressing of products. Systems were shown

in use both for enhancing finished products and for treating fabrics prior to assembly. Treatment of finished products, especially jeans, was the predominant focus of demonstrations with some exceptions. Textile laser systems are increasingly important to the denim products industry where they can be integral to the development of more sustainable production systems for fabrics and products. Laser application in finishing denim is particularly attractive from a production system perspective because lasers can recreate the combined effect of several other chemical and mechanical processes in one single operation. The importance of lasers to denim finishing was reflected in the predominance of laser denim finishing demonstrations at ITMA 2019.

Aside from variations in laser power, which is expressed in watts, internal capabilities of the laser mechanism itself are quite similar across most textile laser systems. Key differentiators from one textile laser system to the next include the software interface and capabilities, the effectiveness of the system over time, and the required production capacity. At ITMA 2019, laser finishing system concepts introduced were focused on design capability, productivity and a systems approach to sustainability particularly in denim processing. One exception to this is Turkish firm VAV Technology that showcased an innovation related to the laser tube itself. Italy, Spain, and Turkey were well represented at ITMA 2019 in the field of laser marking and

engraving. A few Chinese firms were also showcasing laser capabilities, although the main focus of their exhibits was laser cutting rather than finishing.

Italian Laser Systems

Italian firm OT-Las introduced their ReJeans concept at ITMA 2019 emphasizing it as a versatile concept supporting creativity and design flexibility. The concept utilizes their CX-T system which can laser treat textiles in a continuous or stepwise process and offers flexibility for customized products. OT-Las demonstrated the approach with denim feeding into the laser treatment booth from a roll where garment parts were laser treated for finishing effects and cut out for assembly in one combined process. To highlight the creative potential of the ReJeans concept, OT-Las featured products from Ideal Blue, a design and manufacturing company in Italy that utilizes OT-Las treatment in their ethical manufacturing approach to the production of denim products. A diverse array of unique products were shown with details such as elaborate repeating textile designs, tonal photographic effects, and novel textures achieved through laser treatment. OT-Las also offers a roll to roll laser treatment system for creating laser effects continuously on roll goods as well as a number of laser options for a variety of industries beyond textiles. Additional information can be found at <https://www.otlas.com/en/laser-systems/textile-laser-cutting-marking>.

Sei Laser, another Italian firm, showcased their Matrix Textile laser system and its potential as a disruptive technology in denim processing. The modular Matrix Textile system can be used for high productivity roll-to-roll and roll-to-garment part processing allowing manufacturers to mark for assembly, cut garment parts and the finish with laser effects in one step. The flexibility provides an opportunity to optimize production flow in manufacturing. The Matrix Textile system is designed to target quicker turnaround and production, reducing it to a few days in a well-planned production and finishing system. In ITMA

2019 presentations Sei Laser highlighted the eco-friendly nature of the laser processing using no water and no chemicals and the ability to reduce fabric consumption by optimizing fabric utilization. Of particular interest in terms of material utilization and efficiency, Sei included brand marking, care labeling, size information, and style number directly on the inside of the waistband in the demonstration product. In addition, the cut parts were labeled for assembly with some instruction all in the process of doing the laser. Unlike cutting garment parts with blades which inherently includes some limitations in shape cutting, with the Matrix Textile laser, there are no limitations on cut shapes. The approach advanced by Sei Laser offers an appealing solution for a micro-factory environment where flexibility and versatility are key to an effective production system. The Icaro Textile software developed for the laser can process any vector or raster image specifically for adding the laser surface effects including importing a wide range of image file types. Sei Laser also offers the Flexi Denim system for garment processing. More information is available at <http://www.seilaser.com/en/>.

Italian firm Tonello also offers unique design capability in their system offering an online shop for laser design, claimed as first in the world, with downloadable designs available 24/7 and custom laser design service. In addition to the new laser software which is touted as user-friendly and responsive, Tonello's mannequin laser systems allow 360-degree treatment for authentic laser effects mimicking actual wear and crossing seamlines. This is in contrast to folding products flat and laser treating them on a table one side at a time where effects can't continue around the garment. Four variations of the Laser Blaze are available offering fixed or double sliding table, mannequin, table and mannequin, or conveyor loading. The system includes a design library of laser designs to get new users started. The Laser Blaze at ITMA featured a flat table with a laser head could be positioned in either of two locations to support two loading tables side by side. Fits

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happening on the other. Sample products shown included both denim jeans and knit T-shirts. More information about the Lazer Blaze and other finishing equipment can be found at <https://www.tonello.com/en>

Spanish Laser Systems

Jeanologia, a Spanish company, offers lasers in a variety of configurations targeted to differing levels of production, from its Flexi Lab flat booth system for prototyping and small-scale production to the Twin Pro mannequin system that employs two laser heads for simultaneous treatment of both legs of a garment. Jeanologia laser components included a mannequin type laser which can treat jeans on a form, and a flat bed type system capable of handling varied products such as jackets and T-shirts. Jeanologia's eMark software drives the lasers and offers enhanced design capabilities and tools for novel effects tools including a light scraper, light PP spray and light drill to easily mimic manual and chemical finishing processes. At ITMA, Jeanologia included its laser equipment as part of a fully conceived finishing system for denim products that also included ozone finishing equipment and a water recycling unit. The system can provide a dramatic decrease in the water consumption of denim processing and is connected by digital technology making it flexible and providing the opportunity for a customizable, customer-responsive production system. Further information about Jeanologia lasers and finishing system can be found at <https://www.jeanologia.com/>.

Spanish company Iberlaser offers a variety of productivity features across its laser models reflecting several approaches. One system features two laser heads each with its own belt feed, allowing constant operation of the laser and continuous loading of products to be processed. Their most advanced laser system uses only one laser tube that can move, allowing laser treatment on a flat table with two automatic loading belts and a mannequin in one unit. Displayed sample product including jeans and T-shirt with all-over repeating textile designs,

pushing beyond the most often seen distressing. <http://www.iber-laser.com/en/>

Spanish Company Macsa ID offers three laser system alternatives including a mannequin, a flat system, and a smaller scale laser for customizing products. The mannequin system features side-scrolling loading for continuous loading and processing. The flat table offers double conveyor loading also for enhanced productivity. The third system provides a 30 cm x 30 cm bed for smaller scale product customization. The company asserts reduction in water use and energy, optimum denim distressing with no chemicals, and productivity of up to 200 pieces per hour. The literature also states that denim lasering has no effect on fiber strength but rather only sublimates the indigo dye. More information can be found at <http://www.macsatextile.com>.

Turkish Laser Systems

Turkish firm VAV Technology has a comprehensive focus on denim finishing technology. They have taken a novel approach to the Predator laser machine series included in their finishing product line by designing it to run with Never-Ending Power Laser Tube Technology. A replaceable gas canister provides the gas mixture needed to produce the laser beam. Consequently, the gas mix in the laser tube of the laser machines gets renewed constantly and never loses its quality. In conventional laser tubes, gas is contained in the laser tube and over time it depletes causing the laser tube to lose power and require replacement. The gas canister in the Predator series machine not only continuously renews the gas in the laser tube, but it can also be easily replaced periodically meaning the supply of gas and the laser power remains constant over time. The machine series includes several flat bed systems and a mannequin system. One machine shown at ITMA 2019 featured a system of four sliding tables, arranged in pairs side by side, feeding a flat laser. As the laser treatment finished, the table inside the machine dropped and began to slide forward and out of the machine while the loaded table

slid above it into the laser booth. The computerized interface allowed the laser computer operator to see what was happening on each of the four tables at any given time, whether a product was processing, waiting, preparing or unloading. VAV Technology includes their laser as a component of their “No Hand Touch” approach to a full system of eco-friendly finishing equipment. They recommend an ozone treatment process to brighten products as needed following laser processing. More information is available at <http://vavtechnology.com/laser-systems/>.

The textile laser configurations from Turkish company Arges Laser are flat table systems with productivity features available to enhance processing speed. The system offers four moveable tables for loading, unloading, and laser treating continuously with two operators working side by side. A projection screen shows what will be engraved where on the products being loaded for laser treatment. Notable features include the 3D+ Optical System to produce better design transitions, thinner lines, and greyscale and the wide range of file types that can be processed by the Arcon software that drives the laser. Arges Laser systems are also eco-friendly with efficiency in terms of power utilization and a fit with sustainable finishing systems. The company offers an ozone washing system as a complement to the laser in a more sustainable processing system. Further information is available at <http://www.best.com.tr/en-us/>.

Chinese Laser Systems

Han’s Yueming Laser from China showed a small scale laser with a bed that can easily adjust to dramatically raise and lower the laser platform. This adjustability allowed the focal length of the laser beam, the distance where the beam actually focuses to engrave with most accuracy and efficiency, to adjust and the laser to accommodate materials of great diversity in thickness and shape. The application envisioned for the laser was to quickly and easily add embellishments or other customizations to finished products. Though the laser treatment surface was small, the laser adjustment

allowed the bed to move up and down for significant variation. Customized products shown to illustrate the application included a shoe and a volleyball. With its small compact size, the company is targeting customization in an environment such as shopping center or mall. Yueming Laser offers an extensive line of laser machines which can be seen at <http://www.yueminglaser.com/>.

CK laser from China offers a variety of lasers including ones that feature the ability to do laser engraving. The lasers systems range vary in size and utilize a flat bed rather than a mannequin. Their systems feature optical placement guides projecting onto the loading surface to ensure that operators can get the materials properly positioned for laser treatment. Additional information is available at <http://www.cklasermachine.com/search/denim.html>.

Chinese firms Golden Laser and Gbos laser both showcased their laser cutting systems at the show. Golden Laser does have some laser engraving systems available including machines targeted to the footwear industry and to textile material processing. Among the offerings is a roll to roll engraving machine for textile roll good. Further information is available at <https://www.goldenlaser.cc/>. Likewise, Gbos laser has a variety of systems available with capabilities from cutting small pieces for lingerie to engraving for denim. They were showing systems that recognized visually what to cut and where. These cutting systems were very small and accurate, such as the size of a garment label. The laser systems recognize color differences so can cut specifically to an outline or a pattern based on the placement of a design on a textile surface. More information about the Gbos laser series is available at <http://www.gboslaser.com/p/green-pioneer-2d-laser-system>.

Conclusion

Sustainability in relation to denim processing and production was a notable theme at ITMA 2019, overall as well as in the laser finishing arena. One of the greatest

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advantages in laser finishing of denim and denim products, aside from its sustainability aspects, it the ability of the laser to produce an extensive range of effects that would otherwise require the application of multiple chemical and mechanical finishing processes using several different pieces of equipment. This capability makes laser treatment an attractive option for firms targeting customized and small run production and micro-factory environments where versatility is key. If supported by a robust, design-

focused integrated software program lasers become a powerful tool in creating innovative products for niche and exclusive markets. Laser firms are starting to explore laser application to other materials beyond denim including pile fabrics and knit goods. In the roll to roll machine configurations offered by some manufacturers, laser finishing is poised to impact the production and finishing of textile materials themselves in the future as well as product categories beyond denim.

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