A Fully-Functional Facility for Smart Textiles

Computerized knitting systems that incorporate knit simulation capabilities, recent advancements in specialized yarns, and improved materials for wearable technologies have created opportunities for rapid garment prototyping and mass-customization of smart textiles. Recognizing this, Drexel University and Shima Seiki have collaborated on a new laboratory at Drexel University.

According to Matthew Llewellyn, VP of Shima Seiki USA, "Drexel University has a number of schools and partners in many fields, which made it an ideal candidate for using Shima Seiki equipment in a variety of ways to address requests from its college and industry sources to develop prototypes and virtual samples that respond to a variety of needs."

The Shima Seiki Haute Technology Laboratory is a state-of-the-art knitting laboratory dedicated to advance the field of smart textiles and wearable technology. Genevieve Dion, assistant professor and fashion design program director for Drexel's Haute Tech Lab, states, "The Lab aims to develop smart textiles intended for a variety of high performance textile applications, through the exploration of versatile design concepts and the investigation of manufacturing processes that are both sustainable and mass-customizable."

Lab Equipment

The Haute Tech Lab, which opened its doors in November 2012, includes a computer laboratory, a fabrication laboratory and a finishing and testing laboratory. Dion noted, "Shima Seiki generously donated equipment and the R&D support enabling the Haute Tech Lab to be a fully functional R&D facility for smart textiles. With access to the Shima Seiki 3D knitting machines onsite at Drexel, many test samples can be developed, quickly fabricated, and reconfigured."

With a donation exceeding $1 million, the Shima Seiki Haute Tech Lab equipment includes: one (FIRSTS126S 12G) full-sizer machine for knitting specialty yarns, one (SWEG041N 15G) machine for producing a range of WHOLEGARMENT accessory items; one (PM173X 8G) machine for producing whole-gauge WHOLEGARMENTS; one (6SSG 12G) Intarsia flat-bed knitting machine; and 16 (48DS-ONE APEX) workstations for lab use, which can accurately simulate fabric construction to aid researchers and designers in creating and simulating prototypes, import CAD specifications of the final product, and produce made-to-measure or mass-produced pieces.

Lab Research

Current research at Drexel focuses on applications in the medical and nursing fields, using the technology to make work environments safer through communication and protection technology. Dion stated, "Students are encouraged to participate as research assistants in the laboratory. Undergraduates work as co-op students, and graduate students work on various collaborative research projects as part of their Masters and PhD programs."

Recent projects include garments containing nearly invisible wearable sensors to measure breathing, heart rate and other vital signs for enablers that can detect potential hazards, such as harmful chemicals. This technology can convey critical data, and provide written or spoken reminders to a patient.

Carbon-coated, conductive textiles for flexible energy storage are also being studied. The use of these yarns in the construction of a garment could potentially offer wearers the ability to charge their cell phones from an item of apparel they are wearing.

Additional developments include the utilization of carbon fiber yarns, stainless steel yarns, coated yarns, and yarns incorporating LEDs.

Drexel's Haute Tech Lab Goals

Long-term goals for Drexel's Shima Seiki Haute Tech Laboratory include:

- The development of wearable technology and smart textiles through the exploration of flexible design concepts.
- Incorporation of comfort, ergonomics, and aesthetics to replace bulky instrumentation.
- Exploration of various knitting architecture to fully integrate technology into textiles.
- Insurance of flexibility in production processes through mass-customizations.

- Utilization of state-of-the-art CAD software and equipment to ensure quality, economic viability, and reliability in production.

For more information on Drexel's Shima Seiki Haute Tech Lab, contact Genevieve Dion, gfdion@drexel.edu, 215-895-1779.

Kathlyn Sumatko, president of the FabricLink Network, created TheTechnicalCenter.com for industry networking and marketing of specialty textiles, and FabricLink.com for consumer education about everything fabric.