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Collaboration: A necessary recipe for technological growth

Ongoing crisis situations, such as COVID-19 and the oil spill on the Orange County beaches in California, clearly highlight the need for various forms of collaboration, be it technical or trade. Technological growth in any sector these days depends on knowhow from multiple fields.

Examples of successful collaboration

The timely collaboration between Germany-based BioNTech and USA-based Pfizer showcases the strength in synergistic partnerships for addressing serious global challenges. The mRNA-based vaccines, such as the one their collaborative efforts yielded, have evolved based on years of research that involved both molecular biology and pharmaceutical sciences.

Another example of a technological process involving multiple disciplines is low pressure plasma technology, which is now commercially viable. This technology evolved out of research from fields that include high energy physics, electrical engineering, and mechanical sciences. Plasma finishing technology has become an emerging and sustainable process in the packaging, nonwovens, textile, and composite sectors.

On another front, oil spills have become a recurring problem, affecting human and marine ecosystems. Development of highly efficient and sustainable oil absorbent and containment products, such as mats and booms, requires technical collaboration between the fiber and manufacturing sectors. Additionally, active



Professor Ramkumar and his team at the Nonwovens & Advanced Materials Laboratory at Texas Tech University and India-based Jayalakshmi Textiles have collaborated to create an economically viable and sustainable nonwoven oil absorbent.

engagement with the oil sector is needed to encourage this sector to embrace greener products.

A product example involves the ongoing collaboration between the Nonwovens & Advanced Materials Laboratory at Texas Tech University in the United States and Aruppukkottai, India-based Jayalakshmi Textiles. The collaboration utilizes the available re-

sources and the technical strengths of the partners, which has led to an economically viable and sustainable nonwoven oil absorbent. Results from over a decade of research at Texas Tech University and the manufacturing strength of the textile company based in India have made this collaboration a successful one.

Touch, tissue, and textiles

Touch or feel is very important for the tissue and textile sectors, and the field of touch, known as haptics, is multidisciplinary in nature, involving tribology, mechanics, materials science, neuroscience, and more.

The 2021 Nobel Prize in Medicine highlights an interesting connection between physiology and textiles. The Nobel Assembly at the Karolinska Institute, Stockholm, awarded the coveted 2021 prize for the discoveries of receptors related to touch and temperature to Dr. David Julius of the University of California in San Francisco, CA, and Dr. Ardem Patapoutian of the Howard Hughes Medical Institute, Scripps Research, in La Jolla, CA. Responses to stimuli such as warmth or cold, friction, and outside pressure play an important role in the consumer acceptance of textile and other products. The basic work undertaken by the Nobel laureates will give us a better understanding of sensory perception at the molecular level.

For example, cotton is popular for its comfort and its next-to-skin friendliness and wool is preferred for its thermal comfort, both of which depend on neural responses based on external stimuli such as smooth or rough, hot or cold, etc. In fact, the hot chemical compound in capsicum chili played a part in this year's Nobel Prize.

This year's Nobel recognition has personal significance for me, as I am involved with the understanding of the touch of fabrics. From 1994 to 1998, I undertook my doctoral dissertation research on the hand of fabrics while at the University of Leeds, UK. The work at Leeds led to the development of an artificial human finger for evaluating the feel of fabrics using polymethyl siloxane to mimic the human finger. This development came out of a collaboration with Leeds Dental School.

Trade partnerships are vital

Not only are technical collaborations vital these days, but also trade partnerships. This is important for the pulp and paper industry, nonwovens, and textile sectors. The United States cotton industry is depend-



Artificial finger to evaluate the touch of fabrics resulted from a multidisciplinary approach. (Source: S.S. Ramkumar, Ph.D. studies, 1998, University of Leeds, UK.)

ent on good trade relations with importing countries, and hence, trade deals with countries like China are critical. Such is the situation with the semiconductor industry, where the United States depends on Taiwan and South Korea for semiconductor chips. Developed nations depend on low wage countries for commodity goods like home textiles and electronics.

The pandemic has been a wake-up call for us to strengthen our manufacturing sector. There is an urgent need to develop our infrastructure and manufacturing sector, which again depends on good dialogue and collaboration among stakeholders involving policymakers, academia, and industry. Industry and academia should engage in timely discussions so that we are ready with a well-trained workforce. In such dialogues, professional associations such as TAPPI have a role to play. It is through such professional associations that practical knowhow can be disseminated to students, which is vital in developing a knowledgeable workforce that is equipped with both theoretical and practical knowhow.

Governments should involve with professional and trade associations to create funding mechanisms to support such knowledge-imparting collaborative programs. Industrial sectors should not work in silos and should engage in multidisciplinary discussions and collaborative projects. Again, professional associations can play their part by bringing in speakers from allied disciplines to their technical conferences so that participants can gain new knowledge that translates into new processes and products. **TJ**

Ramkumar is the immediate past chair of TAPPI's NET Division and a professor of Nonwovens and Advanced Materials at Texas Tech University, in Lubbock, TX, USA.