PREPARING FUTURE LEADERS IN THE FOREST PRODUCTS INDUSTRY

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Innovation in Paper Science and Engineering at the University of Wisconsin–Stevens Point

This is the first in a series of editorial profiles featuring the academic and research portfolios of Forest Products Universities focusing on pulp and paper science and engineering, biorefinery, bioproducts, and other industry-related topics. These profiles include information about faculty, facilities, student success, and future plans.
– **Arthur J. Ragauskas**, Editor-in-Chief, *TAPPI Journal*

The Department of Paper Science and Chemical Engineering at the University of Wisconsin–Stevens Point was founded in 1970 through a partnership among university, industry, and business leaders. At the time, Wisconsin's paper industry was the largest manufacturing sector in the state, employing roughly 30,000 people, yet it often had to recruit engineers from the East Coast to fill technical positions. Industry leaders wanted to cultivate local talent instead, and that goal, along with the industry's growing demand for engineers, became a driving force behind the department's creation. Dr. Michael J. Kocurek, the department's first chair, established a tradition of rigorous engineering education and close industry collaboration that endures today.

The department graduated its first class of four students in 1974. In the five decades since, it has produced more than 1,000 alumni, many of whom have built distinguished careers in the paper industry and related engineering fields. Throughout this period, the department has adapted to the evolving needs of industry while remaining committed to academic excellence, hands-on learning, and career readiness.

Today, the department offers two undergraduate programs. Chemical Engineering is one of only two such programs in the Universities of Wisconsin, and Paper Science and Engineering is the only program of its kind in the state. Both are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), a mark of their academic rigor and quality. The department also offers a graduate certificate in Process Control Engineering, which responds to rising demand for expertise in industrial automation and advanced manufacturing technologies.

A cornerstone of the department's continued success is the Paper Science and Chemical Engineering Foundation, which manages more than $7 million in assets and provides vital financial support to more than 100 students. Through strong industry partnerships, generous alumni support, and a commitment to student success, the department continues to prepare the next generation of engineers to lead, innovate, and advance the manufacturing industries of tomorrow.

Faculty research themes and recent achievements

Dr. Seyed Javad Amirfakhri, associate professor, conducts research in PFAS treatment and defluorination, water and wastewater treatment, adsorption, catalysis, reaction kinetics, and environmental process engineering. His current work includes developing Ag-, Cu-, and Fe-modified activated carbons for short-chain PFAS adsorption and investigating microwave-assisted oxidative PFAS treatment

using persulfate-based systems. His group also develops energy-normalized performance metrics to compare PFAS destruction technologies and support process design and scale-up. A complementary research area is the simulation and optimization of chemical and environmental processes using COMSOL Multiphysics, CHEMCAD, and MATLAB to evaluate transport phenomena, reaction kinetics, reactor performance, and operating conditions.

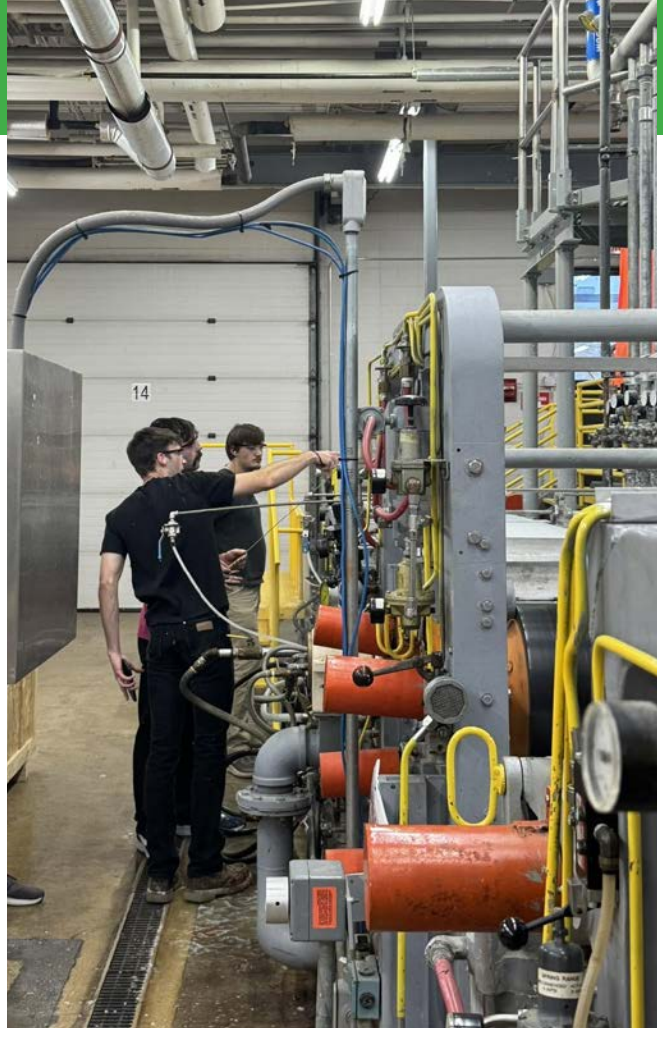
Dr. Amirfakhri's research strongly emphasizes undergraduate research and training. The group has recently published two peer-reviewed articles, has one manuscript under review and one in preparation, and regularly presents at conferences and student research symposia. Dr. Amirfakhri will also present this work at the 2026 AIChE Annual Meeting in Minneapolis.

As professor and chair of the Department of Paper Science and Chemical Engineering, Dr. Roland Gong conducts research in pulping, papermaking, paper coatings, nanocellulose applications, and paper recycling assessment, with a strong emphasis on sustainable materials and manufacturing. One recent research project focuses on developing ultrathin nanocellulose films using an innovative approach to enhance oxygen and aroma barrier properties for sustainable packaging applications.

Dr. Gong also led a collaborative research project involving undergraduate students, community members, and industry partners to evaluate locally sourced hardwood pulps as alternatives to imported eucalyptus pulp for tissue production. The findings demonstrated that local hardwood pulps offer potential advantages in strength, softness, and absorbency. This research highlights the opportunity to optimize pulp furnish blends to achieve a desirable balance between product performance and manufacturing costs while promoting the use of regional forest resources.

Roland Gong, Ph.D., Department Chair, Paper Science and Chemical Engineering University of Wisconsin–Stevens Point

As a strong advocate for undergraduate research, Dr. Gong actively engage students in research projects, providing valuable hands-on experience and opportunities to collaborate with industry professionals. To contribute to advances in sustainable pulp and paper technologies, he regularly presents research findings at national and international conferences, including TAPPI Nano and TAPPICon.



State-of-the-art labs and hands-on education

The Department of Paper Science and Chemical Engineering at UW–Stevens Point boasts some of the finest laboratories in the nation dedicated to undergraduate engineering education, particularly in paper science and engineering. These extensive facilities provide students with exceptional hands-on learning opportunities using industry-relevant equipment and technologies.

The department features a 22-in. Fourdrinier pilot paper machine capable of producing paper with basis weights ranging from 30 to 300 g/m² at operating speeds of up to 200 ft/min. Its comprehensive stock preparation and wet-end systems include a pulp proportioner, centrifugal and pressure screen cleaners, steam injection for pulp slurry heating, a save-all system, wet-end chemical dosing stations, and an inline fiber analyzer. In collaboration with the inventor of the displacement press, an innovative wet-pressing technology, the department has initiated a joint research project to investigate its potential for energy savings and improved product performance in tissue and packaging grades.

The department also houses a state-of-the-art Faustel 12-in. pilot-scale coater and laminator equipped with a corona treater. This versatile system supports 11 coating methods and accommodates a wide range of substrates, including paper, plastic films, and metal foils, providing

exceptional capabilities for research and development in functional coatings, sustainable packaging, and advanced materials.

The Pulp and Papermaking Laboratory features a brand-new M&K dual 10-L pulp digester, along with comprehensive equipment for pulp bleaching, fiber characterization, pulp evaluation, and handsheet preparation. The Paper Testing Laboratory is equipped to conduct a wide range of mechanical, surface, physical, and optical tests on various paper grades, including printing and writing papers, paperboard, and tissue products.

The recently established Unit Operations Laboratory further strengthens the university's engineering education and hands-on training capabilities. The laboratory features an Edibon distillation tower, a variety of Armfield unit operations systems, including a cooling tower, and Festo process control and programmable logic controller (PLC) training systems. These facilities provide students with valuable opportunities to apply engineering principles to real-world processes in chemical manufacturing, process automation, and industrial operations.

In collaboration with the Wisconsin Institute for Sustainable Technology (WIST), a center within the College of Natural Resources at UW–Stevens Point, the university's laboratories are among the few facilities nationwide offering specialized testing services for paper and packaging materials, including recyclability, repulpability, and compostability assessments. These capabilities support both undergraduate education and industry-driven research, particularly in sustainable packaging and circular manufacturing.

In addition, the lab is equipped with adequate facilities for PFAS adsorption, catalyst synthesis, reaction engineering, and contaminant degradation. The laboratory includes sieving equipment for particle-size separation, reactors, drying systems, and furnaces for preparation and thermal treatment of activated-carbon-based adsorbents and metal/metal-oxide catalysts. The group also operates microwave-assisted and conventional thermal treatment systems. Analytical capabilities include ion-selective electrodes for fluoride measurement and pH analysis, with access to ^{19}F NMR, GC, LC-MS/MS, SEM/EDS, and BET analysis for PFAS quantification, material characterization, and surface-area and pore-structure measurements.

Together, these advanced laboratories reinforce the university's commitment to experiential learning, preparing students with the technical knowledge, practical skills, and industry experience needed to excel in their engineering careers.

Undergraduate engineering education

Since its establishment, the Department of Paper Science and Chemical Engineering has focused on undergraduate engineering education, particularly for preparing process engineers to meet the needs of the paper and manufacturing industries. Over the past five years, undergraduate enrollment has averaged approximately 100 students, with nearly two-thirds pursuing double majors in both disciplines. This interdisciplinary education provides students with a broader technical foundation, greater career flexibility, and a competitive advantage in the job market. Some students go on to pursue graduate degrees (M.S., MBA, and Ph.D.) and professional licenses (PE) and degrees (JD).

Although the department does not currently offer a graduate degree program, it launched a graduate-level certificate in Process Control Engineering to address the growing industry demand for engineers skilled in process control and industrial automation — specialized areas not commonly emphasized in traditional engineering curricula. This fully online program combines fundamental principles of process control with practical industrial applications, including process control design, smart manufacturing, and PLC control program. Its distinctive online laboratory resources provide students with hands-on learning opportunities in a flexible, accessible format, making the certificate particularly attractive to working professionals seeking to advance their technical expertise and careers.

Snapshot of student success

Graduates of the Department of Paper Science and Chemical Engineering have experienced outstanding job placement. They are highly competitive in the job market, with on-average placement rates upon graduation. In addition, they have access to extensive internship opportunities driven by strong industry demand and the university's strategic location. Most students complete two or more engineering internships before graduation.

Also, over 95% of Paper Science and Engineering students complete a nine-month industrial co-op, typically beginning after their sophomore year, gaining valuable hands-on engineering experience.

Vision and priorities for the future

Over the next 5–10 years, the Department of Paper Science and Chemical Engineering aims to strengthen its position as a leading undergraduate engineering education program, preparing highly skilled engineers to meet the evolving needs of Wisconsin's manufacturing industries and beyond. The university plans to expand its partnerships with high schools, technical colleges, industry leaders, and community organizations to strengthen student recruitment and build a sustainable pipeline of future engineers.

The resurgence of U.S. manufacturing, coupled with the retirement of the baby boomer generation, is expected to drive strong demand for engineers, particularly process and chemical engineers. To address these growing workforce needs, the Department of Paper Science and Chemical Engineering will remain committed to high-quality education through small class sizes, integration of emerging technologies into the curriculum, enhanced hands-on laboratory experiences, and extensive co-op and internship opportunities. These priorities will ensure that the university's graduates are well prepared to enter the workforce and make immediate contributions to the manufacturing industry.

The manufacturing sector, particularly the paper industry, is undergoing a significant transformation driven by sustainability, advanced materials, energy efficiency, and circular manufacturing. Our faculty will continue to advance applied research in emerging areas, including nanocellulose and advanced fiber-based materials, sustainable packaging, functional barrier coatings, energy-efficient pulping and dewatering processes, decarbonization, wastewater treatment, and PFAS removal. Through close collaboration with industry partners and active undergraduate research participation, we aim to translate research innovations into practical solutions that improve manufacturing efficiency, product performance, and environmental sustainability.

ABOUT THIS EDITORIAL

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