Our Passion: Safe, Sustainable Sources of Drinking Water. Clean Environments. and Creating and Commercializing Technology to Make Them a Reality.

The world is awakening to its water crises. Whether you live on the parched plains of Africa, in drought stricken areas of the United States, urban areas with antiquated infrastructure, or on the shores of the Great Lakes where 18% of the world's freshwater is threatened by nutrients and emerging contaminants, you can no longer take access to reliable sources of safe, fresh drinking water for granted. We are passionate about commercializing the broad range of technologies being created in the laboratories of the Water Equipment and Policy I/UCRC Research Center (WEP). They represent the best hope of solving many of these increasingly complex challenges. WEP researchers collaborate closely with their members from industry, governmental agencies, and NGOs to create game changing real-time sensors and devices, systems, and novel new materials. WEP research also generates objective data to help decision-makers adopt informed policies that address the everyday challenges of local communities. We invite you to become acquainted with WEP's resources and research, and learn how you can collaborate with us on the front lines of the battle for safer sustainable water and a cleaner environment.

Dr. Deyang Qu,
Interim WEP Center Director

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Water Equipment & Policy
I/UCRC Research Center

Pushing Technology Through Proof of Concept to Prototyping and on to Our Members to be Commercialized

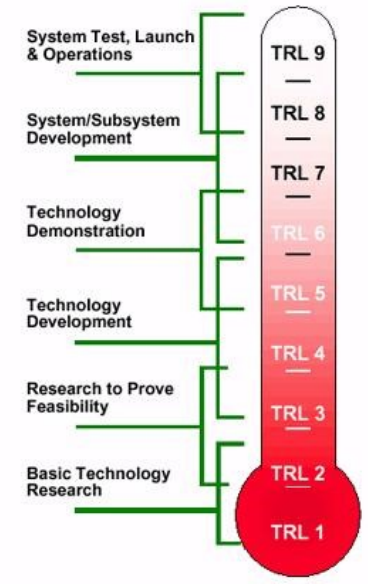
When the National Science Foundation launched the Industry/University Cooperative Research (I/UCRC) program in 1974, its stated mission was to create and transfer groundbreaking academic research to companies to be commercialized, providing them with a competitive advantage, and products that benefit society. Today there are more than 75 I/UCRCs and a thousand faculty researchers collaborating with more than 1100 industry members on precompetitive research in practically every conceivable area of technology.

In 2010 leaders from academia, business, and government collaborated to launch the Water Equipment and Policy I/UCRC Research Center. Since it's humble beginnings WEP has grown from 5 to more than 15 members and has generated over $9 million to fund its research. WEP is well on its way to fulfilling its mission of becoming:

1. The recognized leader producing new, breakthrough water technologies in the marketplace, as well as information for policy makers to improve global water quality.
2. The first-choice center for water organizations to join for technology and policy research.

WEP's growth has been propelled by its commitment to provide its members with research outcomes they can adopt to sustain their growth by meeting the evolving needs of their customers.

To promote commercialization, WEP created a culture of accomplishment by embracing the disciplines of project management and adopting NASA's Technology Readiness Levels (TRL) system. TRL is a type of measurement system used to assess a technology's maturity level. It helps WEP members to better evaluate projects, the level to which they should be funded, and to collaborate with WEP researchers on strategies to advance and commercialize them. By adopting new methods familiar to industry, WEP has dramatically increased its number of patents and licensing agreements with its members.



TRL 1 → TRL 9

Phase 0 Discovery: (Fundamental research in PI's lab. Funded by Federal grants, PI's lab)

Phase 1 Proof of application: (Engineering exploration in the PI's lab that is more applied. Funded by federal/industrial funds; WEP I/UCRC)

Phase 2 Prototyping: (Technology development in incubator. Funded by, federal/industrial /private funds, PFI, SBIR/STTR)

Phase 3 Scale-up manufacturing: (Commercial development by member R&D.

Collaboration Between Industry and University Scientists is WEP's Key to Commercializing Breakthrough Innovations

WEP university researchers, and its industry members share a common goal… commercializing the center's precompetitive applied research.

To achieve this, WEP has created a culture in which university researchers closely collaborate with industry members throughout the entire research cycle.

Request for Proposals: Each Spring WEP staff and industry members collaborate on writing an RFP to address member needs. It is then distributed to university scientists pursuing a broad range of research areas with applications in the water industry.

Writing Proposals: Because industry members vote on those projects to be funded, researchers are encouraged to work closely with members in writing their proposals to increase the probability that research outcomes meet member needs and lead to commercialization.

Project Mentoring: When members decide which of the many proposals will be funded, they also assign engineers as mentors to collaborate on projects. Mentors and researchers meet monthly to review progress, and share ideas on how best to advance toward commercialization.

Biannual Review Meetings: Twice a year projects are reviewed during formal high level meetings involving members, researchers, WEP staff, and the National Science Foundation.

Monthly Staff Lunch Meetings: Every month members and WEP staff meet to discuss topics of center operations and management.

WEP is among the National Science Foundation's most successful I/UCRCs in commercializing research. Here are two examples of the successes resulting from this collaborative culture.

Real-Time Sensors

UW-Milwaukee Distinguished Professor Junhong Chen collaborated with members to create a prototype of the world's first miniature, low-cost sensor that can detect heavy metals in real-time. As a result three members have signed royalty-free licensing agreements to commercialize the technology. An NSF video on this research can be accessed at https://www.nsf.gov/news/special_reports/science_nation/leadiondetector.jsp

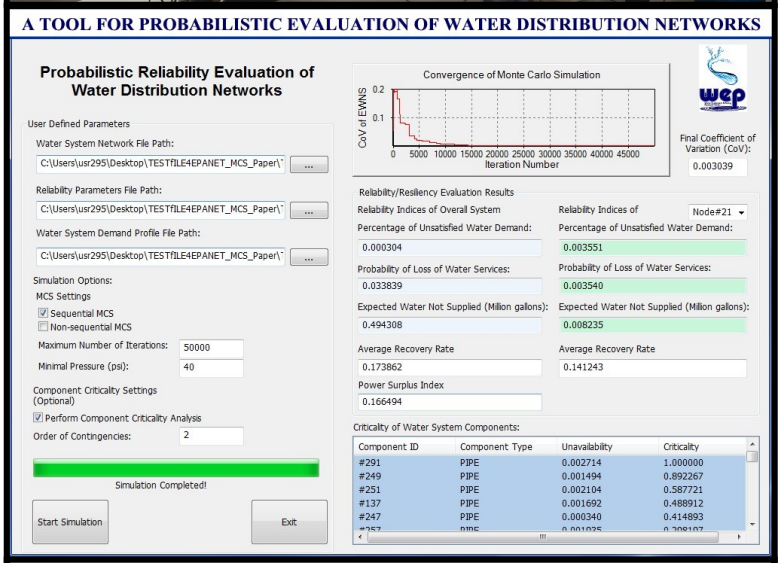
Ultrasonic Flow Meter

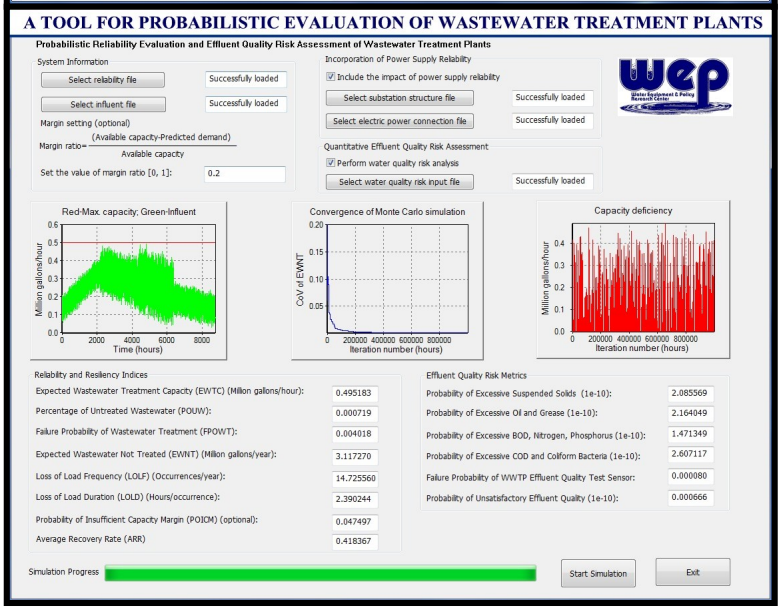
Marquette University Professor Emeritus Shrinivas Joshi collaborated with members to create miniature high efficiency transducers for application in ultrasonic flow meters. One WEP member has signed a royalty-free licensing agreement to commercialize the technology.

WEP Scientists are Creating the Components for the Intelligent Water System

News reports of lead contaminated drinking water have served as a reminder that the quality of the water leaving a treatment plant isn't always the same as that pouring from a homeowner's tap. Imagine a drinking water plant operator being warned in real-time of lead levels that exceed the EPA guidelines. And imagine at the same time a resident is being warned by an alarm of the dangerous lead levels coming into her home. This is no longer the subject of futuristic imagination, but a soon to be reality because of the intelligent water system technologies being advanced in labs at the Water Equipment and Policy Research Center.

WEP researchers have already created prototypes of low-cost miniature real-time sensors that will detect heavy metals and organic contaminants. They are now collaborating with industry members to embed these fingernail sized sensors in water meters, filters, and pumps that would be distributed throughout a water system to instantly inform plant managers and residents of water quality issues.





WEP researchers are also developing powerful software tools that will help operators analyze the reliability of their plants, and plan maintenance and capitol improvements.

A Comprehensive Software Tool for Probabilistic Risk Assessment of Water Industry Infrastructure

Aging infrastructure and higher integration of cyber technologies are resulting in increasing uncertainties for the water sector, which may impact the reliability, cybersecurity, and resiliency of modern water and wastewater infrastructures. UW-Milwaukee Associate Professor Lingfeng Wang created commercial-grade comprehensive decision-making tools for evaluating and optimizing the planning and operations of water facilities in this evolving sector.

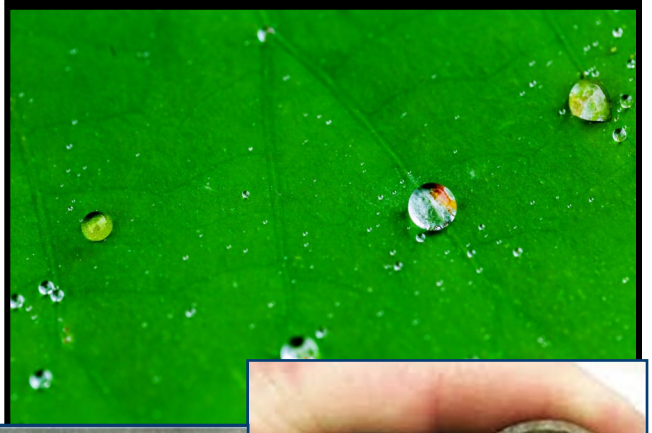
WEP Scientists are Creating New Materials that will Transform the Water Industry

The challenges are daunting.

- Researchers estimate the U.S. loses 2.1 trillion gallons of treated drinking water every year to failing infrastructure, including leaking pipes. And the losses are even greater overseas.
- Biofilms that commonly coat pipes and other water system components lead to corrosion, impair water quality, and inhibit flow increasing pumping and distribution costs.
- According to the Environmental Protection Agency, water for 10 million U.S. homes and buildings are delivered through pipes containing lead.

Business as usual will not solve these problems. It will take adopting new transformative materials like those being created in the labs at the Water Equipment and Policy Research Center that will lead to a new generation of sensors, devices, and systems.

- New low-cost sensors that can detect lead and other contaminants in real-time.
- Pipes that seal themselves when leaks develop.
- Plumbing components with superhydrophobic surfaces that resist the development of biofilms.



Creating a new generation of materials

UW-Milwaukee Distinguished Professor Pradeep Rohatgi is focused on creating new materials and processes that address these challenges. To be successful his research must produce materials that can be applied in the real-world of WEP member manufacturing processes, and they must be cost-effective when compared to today's technologies. Dr. Rohatgi and his research team have developed processes to create superhydrophobic surfaces similar to the leaves of the lotus flower that grows in muddy swamps, but never gets dirty. The microscopic surface structure of its leaves repels water, continuously washing away the dirt and debris. Dr. Rohatgi is also creating materials that seal themselves when leaks develop by casting metals containing tiny balloons of healing agents, that when ruptured, plug leaks as they form.

WEP Scientists are Creating Innovative New Systems for Safe, Sustainable Sources of Drinking Water and Wastewater Treatment Plants that Protect the Environment

Garbage in... garbage out is an old IT adage. It is even more relevant to the freshwater cycle. Waste discharged from treatment plants, and run off from urban and agricultural areas, collect in ground and surface water, which in turn is returned to drinking water plants to be cleaned, treated, and consumed. Many wastewater treatment plants designed decades ago are ill-equipped to remove new classes of contaminants such as pharmaceuticals, and cleaning agents used everyday in U.S. households. Also, its becoming increasingly common for intense rain events that wash contaminants from paved streets, to bypass overwhelmed treatment plants, and flow into the environment.

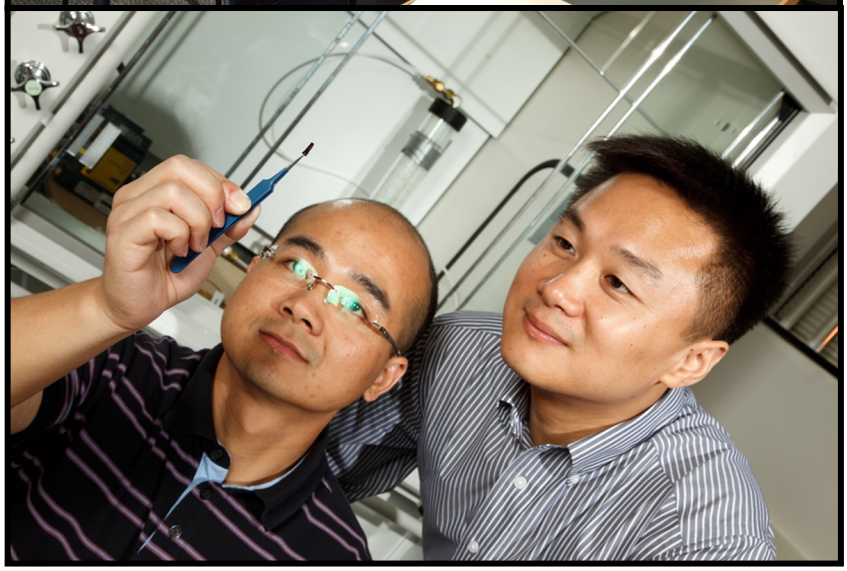
WEP scientists are creating a broad range of new technologies and systems to be applied in sustainable water ecosystems that provide clean, safe drinking water, and protect the environment.

Cleaning up During the Storm

Marquette University Professor Daniel Zitomer and his team of researchers are creating a new Advanced High-Rate Wet-Weather Treatment System that will come online during the initial minutes of a rainstorm when runoff is most contaminated. The new system will treat and disinfect the runoff to higher levels of quality than the rivers and lakes in which it will be discharged.

What's unique about this system is it will sit idle most of the time and then come online quickly to augment primary treatment systems.

WEP Research Equips Policy Makers with Data to Make Informed Decisions Critical to Adopting New Breakthrogh Technologies



Water industry regulations both drive and constrain the adoption of new technologies, and stakeholders interested in regulatory outcomes lobby decision makers to support their causes. Regulations and building codes set at all levels of government affect the design of water and wastewater treatment processes and systems. At times regulators are forced to set policy without access to complete and objective information to guide them in making informed decisions.

WEP has funded the creation of novel new materials, real-time sensors that detect heavy metals and organic contaminants, and new systems to better treat and reclaim wastewater and protect the environment. But often adopting and applying these innovations depends on changing existing regulations.

Because of the importance of regulations in the water industry, WEP is the only center in the National Science Foundation I/UCRC program whose mission addresses policy. WEP is not a lobbyist or policy maker. Rather, WEP funds research addressing important policy issues that provides decision makers with objective data-based information to make informed decisions.

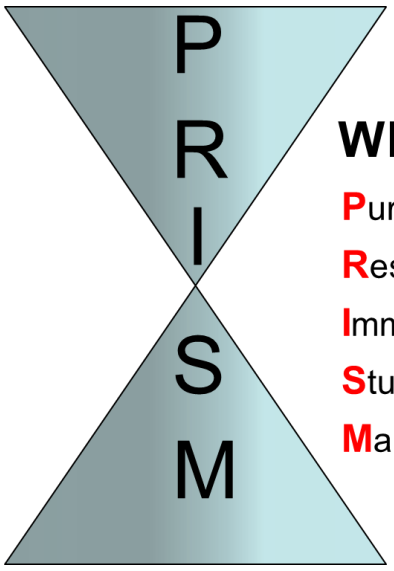
Reducing chloride discharges to area waterways; a menu of options for policymakers

Professor David Strifling of Marquette University has evaluated a menu of options for policymakers to address the excess application of salt for winter deicing, in combination with other sources, that cause high chloride concentrations in area waterways. His research will serve as a lens to examine several potential responsive policy options, including legislation or regulation to impose mandatory compliance measures, or a “salt tax,” green infrastructure, integrated watershed management, and self-governance at the community or individual levels incentivized by regulators or demanded by customers and the public. This has the potential to serve as a policy template for responding to similar issues in the future.

Members Benefit from a Research Program Designed to Deliver Innovative Technologies

The Water Equipment and Policy Research Center is a collaborative nonprofit organization of research universities and members including corporations, government agencies, and NGOs. WEP operates under the auspices of the National Science Foundation's Industry/University Cooperative Research (I/UCRC) program launched more than 40 years ago, and WEP's noteworthy success is the result of embracing the program's best practices. Member's annual dues fund pre-competitive research in four areas important to the water industry: materials, sensors and devices, systems, and policy. Members benefit in many ways.

- They can receive royalty-free access to intellectual property created from the center's research.
- They stretch their budgets with significantly reduced risks on scientific research by pooling research funds with other members, and with access to additional NSF research funds.
- They work with talented engineering students who are potential future employees.



WEP'S Guiding Principles

Pursue collaboration

Research for game changers

Immerse in members' businesses

Student focused

Manage through frequent personal contact

Companies and organizations in the U.S. and overseas interested in collaborating on creating the next generation of water technology and products are encouraged to contact us for more information, or access our website at www.wepiucrc.com.

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