Water Equipment & Policy (WEP) NSF I/UCRC
at University of Wisconsin-Milwaukee (UWM) and Marquette University
Call for Proposals – 2018

Overview: University of Wisconsin-Milwaukee (UWM) and Marquette University (MU) have started an NSF Industry/University Cooperative Research Center (I/UCRC) on Water Equipment & Policy (WEP) (http://www.wepiucrc.com). Funding for research in the center comes from industries, public utilities, and various organizations who are members of the center. The center currently has eighteen members: A. O. Smith Corporation, Badger Meter, Inc., Pentair Inc., Milwaukee Metropolitan Sewerage District (MMSD), Marmon Water, Wisconsin Department of Natural Resources (DNR), Veolia, Rexnord, Baker Manufacturing, Metropolitan Water Reclamation District of Greater Chicago (MWRD), City of Fond du Lac Wastewater, NEW Water, Sloan, The Dow Chemical Company, US Environmental Protection Agency (EPA), Watts Water, Water Quality Association (WQA), and ZeroWater. These companies and organizations are also members of the center Industrial Advisory Board (IAB). The IAB is responsible for selecting the projects that are funded. The WEP center is pleased to announce that it will award around $750,000 in the eighth round of research grants. These awards will be made to seed promising research in areas that are defined in the center technology roadmap and will benefit member companies and organizations.

Research Areas: The center seeks to emphasize the following research areas that are of interest to its IAB members. Ideas that are not included in the following list but can significantly impact the water industry will also be considered; however, a convincing justification is needed.

1. Materials
    a) High wear / low friction coatings for water treatment device dynamic sealing surfaces.
    b) Adsorbents for micro-contaminants: i.e., endocrine disrupters, etc.
    c) Adsorbents for heavy metals: i.e., lead, mercury, arsenic, cadmium, chromium, etc.
    d) Accelerated wear testing: metal on metal, metal on plastic – in a flow stream. Composites for pressure vessels:
        - Eliminate brass and stainless
        - Larger sizes (6”, 8” and 10”)
    e) Organic and inorganic coatings that are low-cost, low-cure temperatures, environmentally friendly.
    f) Adsorbents for TOC removal: i.e., humic acid, etc.
    g) Surface treatment of oxides for improved oxy-anion (e.g., Arsenic) adsorption properties.
    h) Inexpensive alternatives to phosphate as corrosion inhibitor for drinking water supplies.
    i) Water absorption:
        - Materials for pavement
        - Analytics
    j) Substitute (e.g., organic materials) for Mannic polymer (fossil hydrocarbon-based material) that is used for sludge dewatering.
    k) Low friction/low drag surface treatment to reduce energy consumption for hydroelectric applications.
    l) Corrosion resistant technologies.
    m) Hydrophobic coating / treatment technologies.
    n) Surface treatments for fouling mitigation / prevention.
    o) Scale reduction technologies.
    p) The development of absorbents for trace heavy metals (wet FGD wastewater treatment).
    q) Inexpensive alternatives to phosphorus-based corrosion inhibitors (used frequently in boilers and as anti-scaling chemical upstream of RO systems).
    r) Economic materials for the treatment of anaerobic digester biogas.

2. Sensors & Devices
    a) Static (no moving parts) flow meter technology.
    b) Detect presence or lack thereof target microbiological contaminants. Must be able to speciate between target contaminants and non-pathogenic strains.
    c) Detect heavy metals of interest (lead, mercury, arsenic, cadmium, chromium) for treatment systems breakthrough.

- d) Technology for detecting metals, bacteria, pathogens, and cyanotoxins from blue-green algal blooms, with applications for both surface waters and finished drinking water.
- e) Pressure sensors – low cost.
- f) Temperature sensors – low cost.
- g) Leak detection sensors – low cost, including whole home leak detection sensor that would shut off water to home if there is a leak.
- h) Analytics – low cost.
- i) Detect and differentiate between monovalent ions and polyvalent ions (preferably focusing on cations).
- j) Sensor to measure ppm level lead in the water, i.e., less than 10 ppm or greater than 10 ppm. Must be a real-time sensor with instant read. It would be a plus if this sensor could detect and report bacteria (needs to be defined).
- k) Affordable, ultra-sensitive water analysis for trace nutrients.
- l) Low cost phosphate and nitrite sensors for wastewater and surface and ground water applications.
- m) Low-cost, supervisory control and data acquisition (SCADA) - integratable sensors (would be great to keep monitoring costs <$1K per bmp) for monitoring the performance of green infrastructure.
- n) Real-time bacteria sensor for use in natural, turbid systems.
- o) VOC and TOC sensors
- p) Monitoring for pharmaceuticals using online sensors in wwtp
- q) Flow sensor technologies
- r) Real time condition monitoring technologies
- s) Sensing devices for trace metals (for in-line real time monitoring)

3. Systems
   - a. Grey Water:
     - New, game changing ideas
     - Residential system
     - Waste heat regeneration
   - b. Nutrient removal and recovery.
   - c. Preventing basement backups.
   - d. Connections and systems that can be installed by consumers and contractors that are far easier (cost effective) to install.
   - e. System to replace Reverse Osmosis.
   - f. Alternative biocides for use in water treatment products.
   - g. Filtration technology.
   - h. Micro-scale technology for residential/commercial application.
   - i. TOC removal systems that do not use disposable media or filters.
   - j. Optimize anaerobic food waste-to-energy/resources process. Potential team with third party software data management provider including sensor applications described above. Research sensors to support this technology.
   - k. Wastewater treatment technology focused on efficiency, reduced cost and energy use.
   - l. Managing sewer overflows.
   - m. Biodegradation of bioplastics in various controlled anaerobic systems.
     - i. WWTP
     - ii. Dairy
     - iii. Cheese
     - iv. Brewery
     - v. Other
   - n. Ammonia-Nitrogen recovery from wastewater for reuse as fertilizer.
   - o. Garbage disposals vs. source separation and anaerobic digestion of food waste. Which approach is more efficient?

p. Co-fermentation of high strength organic waste (including food waste) with primary sludge for generating organic carbon for biological phosphorus removal.
q. Mainstream anaerobic treatment.
r. Green technology for stormwater treatment.
s. Low pressure thermal hydrolysis for sludge pretreatment.
t. Biological phosphorus removal sludge dewatering.
u. Ferrous iron for sewer odor prevention and the fate/recovery of resulting phosphate precipitates for beneficial use.
v. Alternative de-icing systems.
w. Chemical and energy savings strategies in WWTPs.
x. Recovering or reuse of Grit.
y. CFD simulation on the cavitation process and methods to eliminate the cavitation for the energy dissipation process at hydroelectric plants.
z. Evaluation of processing requirements of algae harvested from wastewater nutrient recovery operations to create algal-based commodity products
aa. Inexpensive, high resolution, low energy (no lighting) technology for inspection of medium to large sewers
bb. Reuse or resource recovery from sewage sludge incinerator ash
cc. Reduction/removal of nitrogen from non-point sources
dd. Drain pipe re-design to increase carry at toilet flush volumes below 1 gallon per flush (gpf).
ee. Reuse of chaff, a byproduct of Milorganite production.
ff. Determining and/or increasing consumer knowledge regarding effectiveness of various point-of-use water filters.

4. Water Policy:
   a. Rain water re-use policy for residential and commercial applications focusing on requirements for treated water quality, minimum treatment level and monitoring requirements.
   b. Regulatory: Important topic with little guidance from State or Federal.
   c. Multi-stakeholder (Milwaukee area) food waste to resource management program that fosters policy change for optimum allocation of wastes from restaurants, grocers, food processors, grease traps, and agriculture products by removing institutional, policy, regulatory, and market impediments to allow attraction of private investment in a food waste-to-resource program and supporting infrastructure.
   d. Lake Michigan near-shore circulation model used to quantify the nutrient (e.g., phosphorus) assimilative capacity and calculate wastewater discharge effluent limits for municipalities and industries; applying and calibrating the near shore circulation model to new locations.
   e. Cost-effective innovations for nutrient removal from wastewater (e.g., increased efficiency in microfiltration, biological removal, compact infrastructure).
   f. Advances in irrigation technology that reduces risks to human health when spraying manure (e.g., pathogen filtration, wind sensors).
   g. Microparticle policy for protecting the Great Lakes and other marine environments.
   h. Urine separation. Keeping urine out of raw wastewater will reduce ammonia inflow to WWTPs and reduce energy demand.
   i. Watershed approach for control and management of pollutants, such as chloride and nutrients, from both point and non-point sources.
   j. Policy considerations to reduce chronic chloride stress in area waterways.
   k. Strategy and technology for maximization of methane production in a wastewater treatment plant.
   l. System to bring regulators up to speed on state-of-the-art analytical tools/methods and a means to register them as approved methods for regulatory reporting.

m. Barriers to implementation of green infrastructure.
n. Tax incentives for green infrastructure adoption.
o. Guidance or recommendations for the chemical makeup of the inhibitor based upon the chemistry in the raw and finished water for various types of systems.
p. Microbeads/nanoparticles – presence, removal effectiveness, impacts on water and wastewater.
q. Regulatory framework for reduction of non-point sources of pollutants/nutrients.
r. Modeling of receiving waters (lower Green Bay) for ammonia toxicity.
s. Characterization of wastewater as it relates to viruses.
t. Impact of low flow faucets (0.35 gpm) on hand washing compliance in healthcare.
u. Lake Michigan near-shore circulation models to quantify available assimilative capacity for phosphorus

Award Amounts: The maximum award size for new projects is $50,000/year, but the maximum award size for continuing projects may be up to $100,000/year, including 10% indirect costs. Funding periods shall initially be for one year, with clear deliverables stated. In the case of continuing projects, proposals need to be submitted annually with a summary of prior accomplishments and well-defined milestones and deliverables for funding requested for the specific year. Continuing projects will compete with new proposals received in the same round. The total funds awarded for this cycle is about $750,000.

Process: Investigators will be asked to submit a project executive summary, a project narrative no more than three pages, including references, a proposal budget with justifications (template provided), and a two-page CV for each PI. **The project narrative should include a detailed review on relevant patents, commercial products, and technologies (benchmarking)**. **It should also include a detailed discussion on potential risks, their probabilities, risk management plan, technology readiness level (TRL), and how WEP members could implement the technology or benefit from the technology upon successful execution of the project.** The PIs are encouraged to communicate with the IAB members to formulate their proposal ideas. Collaborative proposals between UWM and MU are encouraged. As a quality control, proposals will first be reviewed by center administrators to ensure they are complete with all of the information required by the IAB. Satisfactory proposals will then be reviewed by the IAB with possible iterations. There will be a two-week holding period for the IAB to quickly review the project scopes of all proposals received by the deadline. The IAB reserves the right to request any directional proposals during this holding period. If such proposals are requested and subsequently received, they will be considered along with all other proposals received by the deadline for the current funding period. PIs of selected proposals will be invited by the IAB to present at the center fall meeting (October 17-18, 2017) when successful projects will be selected by the IAB.

Qualification Criteria: Qualifying proposals must meet the following criteria:

- **Field of Study** – water-related research areas defined by the IAB.
- **Researchers** – project is for UWM or MU-based research.
- **Funding period** – funding periods shall initially be for one year, with clear deliverables stated. In the case of continuing projects, proposals need to be submitted annually with a summary of prior accomplishments and well-defined milestones and deliverables for funding requested for the specific year.
- **Amount of funding** – up to $50,000/year for new projects and up to $100,000/year for continuing projects (including 10% indirect costs).
- **Intellectual property** – research can lead to potential intellectual property.

Scientific Evaluation Criteria: Complete proposals will undergo scientific evaluation by the IAB using the following criteria.

- **Quality –** Excellence and novelty of concept, approach, and methodology; benchmarking analysis; clarity and appropriateness of project plans; clear goals and deliverables for each funding period;

desirability and impact of potential results on the IAB member companies and national /international scholarly community.

- **Return –** Return on investment (ROI) through direct implementation of the technology by member companies, research funding from external sources, potential for intellectual property, strengthening partnerships with IAB members, start-up companies and other commercial return measures.
- **Risk –** Availability of necessary skills and experience, likelihood of achieving the intended outcomes; probability of securing extramural funding or engaging in commercialization with the IAB member companies.

Timeline:

- 5/15/17: Call for proposals
- **8/15/17: Deadline for submission of proposals**
- 8/16/16-8/17/17: Responsiveness review by Center Administrators
- 8/18/17: IAB receives responsive proposals
- 8/19/16-9/2/17: Proposal review by the IAB and holding period
- 9/9/17: Directional proposal(s) received by the IAB, if necessary
- **9/29/17: IAB feedback to PIs and invitations issued to selected PIs for presentations at IAB Fall meeting**
- 9/29/17-10/12/17: PIs work with Center Administrators on PPT preparation
- 10/13/17: Final PPT due for all selected proposals
- 10/17/17 and 10/18/17: IAB Fall meeting: Notification of awards
- Award period: 1/1/18-12/31/18

Application Process: Email the completed proposal application in a single PDF file to Dave Marsh: marshd@uwm.edu.

Current IAB members and contact information:
Frank Brigano, Vice President, Research & Development, KX Technologies LLC, fbrigano@kxtech.com (Chair)
Matthew Magruder, Liaison, Milwaukee Metropolitan Sewage District (MMSD), mmagruder@mmsd.com (Vice Chair and incoming Chair)
Bob Heideman, Senior Vice President and CTO, A. O. Smith, RHeideman@aosmith.com (Past Chair)
Jayme R. Kolarik, Global R&D, Certification & Lab Manager, Pentair, jayme.kolarik@Pentair.com
Fred Begale, Vice President of Engineering, Badger Meter, fbegale@badgermeter.com
Brian Weigel, Chief, Water Evaluation Section, Wisconsin DNR, brian.weigel@wisconsin.gov
Dawn Marsh, Engineering Director, Baker Manufacturing, dmarsh@Baker-Mfg.com
Heng Zhang, Assistant Director, MWRD, heng.zhang@mwrd.org
Joseph Hamann, Advanced Engineering Manager, Rexnord Innovation Center, Joseph.Hamann@Rexnord.com
Yann Moreau, R&I Director North America, Veolia, yann.moreau@veolia.com
Autumn Fisher, City of Fond du Lac Wastewater, amfisher@fdl.wi.gov
Nathan Qualls, Director of Technical Services, NEW Water, nqualls@newwater.us
Kay Herbert, Chief Scientist, Sloan, Kay.Herbert@sloan.com
Steven Jons, Principal Research Scientist, The Dow Chemical Company, stevejons@dow.com
Mike Trammell, GM/Sr. Product Manager, Watts Water, Mike.Trammell@wattswater.com
Eric Yeggy, Director of Technical Affairs, Water Quality Association (WQA), eyeggy@wqa.org
Doug Kellam, CEO, ZeroWater, dkellam@zerowater.com