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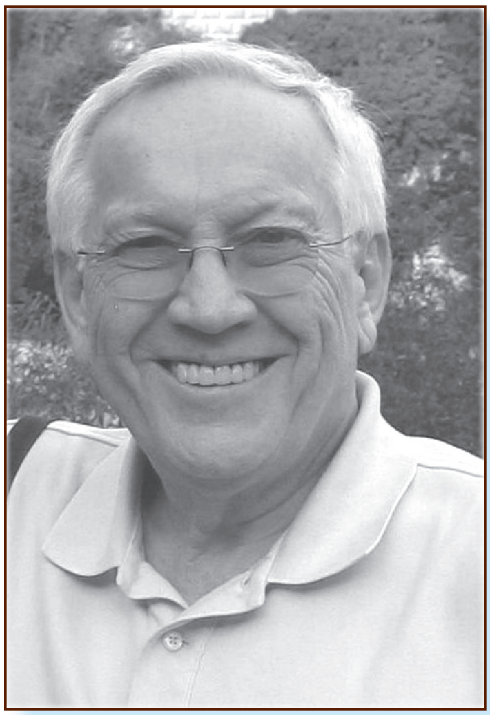
2012

AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS®

The 2012 Kappe Lecturer



Vladimir Novotny, Ph.D, P.E., DEE

Professor Emeritus, Marquette University (Milwaukee, WI) and Northeastern University (Boston, MA)
Director Emeritus, Center for Urban Environmental Studies, Northeastern University
Managing Partner, AquaNova, LLC

Education

Brno University of Technology (Czech Rep.) 1963
Diploma Engineer, Sanitary Engineering
Brno University of Technology 1968
Candidate of Science, Sanitary and Water Resources Engineering
Vanderbilt University 1971
Ph.D, Environmental and Water Resources Engineering

Professional Associations

International Water Association
Water Environment Federation
American Academy of Environmental Engineers
Fulbright Association
Czech and Slovak Society of Arts and Science

Professional Awards and Honorary Appointments

Fulbright Senior Scholar, 2008 - 2013
Endowed 2011 Freeman Lecturer - Boston Society of Civil Engineers
2011 BSCES Technical Group Award, Boston Society of Civil Engineer Section
Visiting Professor, Beijing University of Civil Engineering and Architecture, 2009
Visiting Chair Professor, Capital Normal University Beijing 2006 - 2008
Diplomate of the American Academy of Environmental Engineers, Certified by Eminence, 2005
Member of The International Water Academy, Oslo, Norway, 2002
Sam Jenkins Medal recipient for Outstanding Service, International Water Association, 2002
Outstanding Researcher Award, Marquette University College of Engineering, 1997
Fulbright Fellowship for lecturing and research at the Universities of Venice and Padova, Italy and lecturing at the Mohamadia Technical University of Rabat, Morocco, 1987

Dr. Vladimir Novotny is an internationally recognized scholar and educator. In 2011, he became Professor Emeritus at Northeastern University where he was a CDM Endowed Chair Professor of Environmental and Water Resources Engineering and Director of the Center for Urban Environmental Studies. He continues to be active in AquaNova, LLC (formerly AquaNova International, Ltd). From 1973 through 2002, he taught and conducted research at Marquette University in Milwaukee, WI, and became Emeritus Professor in 2002. He received his undergraduate and part of his graduate education from the Brno University of Technology and his doctoral degree from Vanderbilt University (Nashville, TN) in 1971.

In 1991, Dr. Novotny founded the Specialist Group on Diffuse Pollution and Eutrophication of International Water Association (IWA) for which he received IWA's Sam Jenkins Medal award in 2002. Diffuse (nonpoint) pollution and water quality have been cornerstones of his research and publishing for forty years, and he published in this field ten books and more than 150 peer-reviewed journal and conference proceedings articles and book chapters. His book *WATER QUALITY: Diffuse Pollution and Watershed Management* (2nd edition, Wiley 2003) is a leading text on the topic.

In 2006, he prepared a successful proposal and subsequently organized the NSF, IWA, CDM, and Johnson Foundation sponsored workshop on *Cities of the Future*, attended by leading experts from several countries and held at the F.L. Wright built Wingspread Conference Center. *Cities of the Future* is now an acronym for a worldwide movement of water specialists, landscape architects, urban planners, and NGOs towards a paradigm change, resulting in planning, building and retrofitting urban areas that would reduce water use, restore and protect water resources, and use energy without adversely contributing to the global climatic changes. This was a natural change of the paradigm of environmental engineering from fixing the pollution problems caused by humans to developing urban societies living in harmony with nature where waste becomes a resource and water, energy, and nutrients are recovered and reused. This also necessitates a better management of water resources, eliminating pollution and preventing harmful algal blooms. He published three books and made numerous keynote presentations on this 21st century defining topic in China, Japan, Democratic Korea, Europe, Canada, Brazil, and the US. In 2009, he was appointed to the IWA's Steering Committee for The Cities of the Future.

Abstracts of Lectures Offered

Closing the Water Cycle, Recovering Energy and Resources in the Cities of the Future

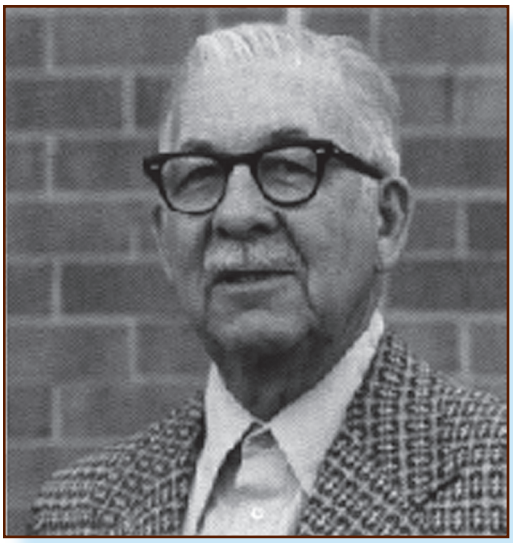
Since the end of the last millennium, it has become evident that the current paradigm of water management in urban areas, in both developed and developing countries, is becoming exceedingly unsustainable, exerting large demands on water, energy and other resources that in the near future, cannot be met by the resources the earth possesses. This imbalance is exasperated by increasing population, people movement from rural area into cities, and contributing to the global climatic change. In the context of a city system, the flow, use and transformations of input water, energy, and materials result in polluted effluents and overflows, air pollution, excessive amounts of solid waste and greenhouse gas (GHG) emissions. The entire flow, use and transformation of resources and energy through the city constitutes urban metabolism. Current urban metabolism is linear, characterized by long distance underground transfers of water to the communities, underground conveyance of used water and stormwater, high energy use for transport, treatment and disposal of used water and solids. The metabolism concept and its footprints will be introduced, which will document the unsustainability problems with the current linear paradigm of urban water infrastructure design and management.

Introducing the worldwide Cities of the Future initiative, the presentation will highlight current developments and concepts of the new (fifth) paradigm leading towards water centric sustainable communities whereby stormwater conveyance is mostly on surface and rehabilitated and restored urban surface and ground water bodies are the integral parts of the entire water cycle system. Water use cannot be separated from energy. The backbone of the new paradigm approach to building new cities and retrofitting the old to become sustainable is distributed water and energy reclamation from used water and stormwater and reusing them in a partially or fully closed urban metabolic cycle based on the concept of the four R's: reduce (conserve), reclaim, reuse and restore. Implicit in these designs is a significant reduction of energy use from nonrenewable sources, and water conservation is the most efficient measure to reduce GHGs. In addition, nutrients (struvite), biofuel, hydrogen, heat, electricity, and organic solids can be reclaimed for reuse. A switch from traditional activated sludge energy demanding wastewater treatment to anaerobic co-digestion of concentrated used water with organic solids (sludge, solid food and yard waste and algae produced from waste nutrients) to produce energy is being investigated. This change will bring the GHG emissions from water systems to net zero or positive (energy producing) and significantly cut down the water and energy use by the entire urban conglomeration. Current and near future developments of sustainable water centric "ecocities" in Canada, China, Singapore, Sweden, Australia and other countries will be presented, analyzed and research needs as well as barriers to implementation will be outlined.

Prevention and Remediation of Advanced (Hyper) Eutrophication of Multipurpose Impoundments – A Case For Integrated Watershed Management

As a result of the intensification of agriculture in the last fifty years and building massive underground sewerage systems in growing communities in the last century, nutrient loads to surface and ground waters have dramatically increased throughout the world, creating eutrophic and hypertrophic water quality in lakes and reservoirs exemplified by harmful algal blooms (HABs) and hypoxic dead zones. The problem is magnified by global warming because the specific bloom causing genera, the cyanobacteria (blue-green algae), prefer warmer water where they can outcompete the other phytoplankton species. Cyano-HABs are exhibited by scrums and pea-soup appearance of the water body. This problem is especially troublesome in impoundments providing water supply to large communities. The problem of the hyper-eutrophic status exhibited by harmful algal blooms of cyanobacteria (Cyano-HAB) is becoming endemic to many impoundments in Europe and Asia including The Netherlands, Germany, China, and in the US (Florida and Texas). In Czech Republic, 70% of reservoirs have been classified as hypertrophic, which during algal blooms impairs their beneficial uses for water supply, recreation, and aquatic life propagation (fishing). Remedies are very costly, drastic and sometimes unsuccessful or transient. The phenomenon of eutrophication has been studied for decades but recently new findings contradict the previous theories such as the role of a limiting nutrient, linearity of the eutrophication progression being related to the input of the limiting nutrient, effect and causes of internal loads, two sided effects of high nitrate loads and even carbon sequestering or greenhouse gases release. Cyanobacteria growth, occurrence and behavior in impoundments defy the traditional mass balance lake models by Vollenweider and others and new modeling methodologies are being developed.

Several cases will illustrate the dilemma, including the stratified Švihov, Orlik and Brno Reservoirs in the Czech Republic, and shallow Lakes Taihu and Donghu in China and Okeechobee in Florida. These impoundments are receiving excessive nutrient loads from nonpoint agricultural and point municipal and industrial sources. However, not all water bodies overloaded by nutrients have developed a full hypertrophic status. The barriers attenuating excessive nutrient loads include agricultural and urban best management practices, buffer zones, restoration and creation of wetlands in conjunction with better agronomy of crops and fertilizer application in agriculture and integrated water, stormwater and used water management in urban areas. Simultaneous anaerobic decomposition of organic matter and nitrate denitrification in restored alluvial riparian buffer wetlands reduce also greenhouse gas emissions of methane and nitrous oxide. Surprisingly, high nitrate content in some impoundments appears to retard or even prevent hyper-eutrophication, which may be the case of the Švihov Reservoir providing water to Prague. The needs for coordinated interdisciplinary research and implementation of remedial plans will be outlined, discussed and developed into a concept of an ecoregion for multiple purpose water bodies and watersheds providing water supply to communities.



“A man’s debt to his profession is to help those that follow.”

STANLEY E. KAPPE, P.E., DEE, a successful environmental engineer, believed he owed a debt to the profession that rewarded him so well. During his life, he gave of himself to his university and to his profession through countless hours of volunteer activity. And, through this Lecture Series, he continues to share his good fortune with tomorrow's environmental engineers.

He graduated from Pennsylvania State University in 1930 with a bachelor's degree in sanitary engineering. He served with the Pennsylvania State Health Department and the U.S. Army Corps of Engineers before joining the Chicago Pump Company as its Eastern Regional Manager in 1935. In 1945, he founded Kappe Associates, Inc., a water supply and wastewater equipment company headquartered in Rockville, Maryland, and continued as its Chief Executive Officer until his death in 1986.

His peers recognized his contributions to the profession by numerous awards, including the AWWA Fuller Award, the WPCF Arthur Sidney Bedell Award, the WPCAP Ted Moses and Ted Haseltine Awards, and the AAEE Gordon Maskew Fair Award. In 1985, Pennsylvania State University named him Outstanding Engineer Alumnus.

Stanley E. Kappe was an activist member and leader in several national and Chesapeake region professional societies. He served as the Executive Director of the American Academy of Environmental Engineers from 1971 to 1981.

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