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Date and Time	Titles and Speakers
23 June 2021, Wednesday 1600 – 1700 (SGT)	A Generalised Approach for Developing Sustainable Solutions for Future Food Production <i>Dr. Pavagadhi Shruti</i> NUS Environmental Research Institute (NERI), NUS
24 June 2021, Thursday 1600 – 1700 (SGT)	A Waste-derived Hydrogel: Towards Sustainable Farming through Minimising Water Leakage and Nutrient Loss <i>Dr. Wee Kee Tan</i> NUS Environmental Research Institute (NERI), NUS
25 June 2021, Friday 1600 – 1700 (SGT)	Biotransformation of Food Processing Wastewater into Microalgae-based High Value-added Products <i>Dr. Sheetal Kishor Parakh</i> NUS Environmental Research Institute (NERI), NUS
28 June 2021, Monday 1600 – 1700 (SGT)	Waste Plastics on Roads: Potentials, Challenges and Building a Circular Economy <i>Associate Professor Raymond Ong Ghim Ping</i> Department of Civil and Environmental Engineering, Faculty of Engineering, NUS
29 June 2021, Tuesday 1600 – 1700 (SGT)	From Waste to Value: Advanced Carbon and Metal Products Derived from Industrial Carbon Waste <i>Dr. Zhiyi Yao and Dr. Cadiam Mohan Babu</i> CBE Eco-Solutions Pte. Ltd. (A NUS Spin-off Company)
30 June 2021, Wednesday 1600 – 1700 (SGT)	Simulation of Wastewater Treatment using Hybrid Model <i>Dr. Ching Kwek Pooi</i> NUS Environmental Research Institute (NERI), NUS
1 July 2021, Thursday 1600 – 1700 (SGT)	Dealing with Hard-to-Treat Industrial Wastewater <i>Associate Professor Lefebvre Olivier Patrick</i> Department of Civil and Environmental Engineering, Faculty of Engineering, NUS

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[NUS Environmental Research Institute](#)

National University of Singapore



Below are pre-recorded technical presentation.
Please click on the links to access the videos.

Presentation No.	Titles and Speakers
Pre-recorded Presentation 1	<p><u>Highly permeable, fouling-resistant hollow fiber reverse osmosis membranes for energy efficient wastewater desalination</u></p> <p><i>Assistant Professor Sui Zhang</i> <i>Department of Chemical and Biomolecular Engineering, Faculty of Engineering, NUS</i> Click here for the video recordings</p>
Pre-recorded Presentation 2	<p>Membrane Technology for Sustainable Solvent Recovery</p> <p><i>Dr. Chunfeng Wan</i> <i>Co-Founder and CEO of Solv8 Technology (a NUS Spin-off Company)</i></p>
Pre-recorded Presentation 3	<p><u>Intelligent Integrated BioSensor (I2BloS) for real-time monitoring of heavy metals and cyanide in Sewer Network and Water Resources.</u></p> <p><i>Dr. Shailesh Kharkwal</i> <i>CEO & Co-Founder of EnvironSens (a NUS Spin-off Company)</i> Click here for the video recordings</p>

For inquiries on the Pre-recorded Webinars, please contact:

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Industry Liaison Office
National University of Singapore



Webinar 1
23 June 2021, Wednesday
1600 – 1700 (SGT)

A Generalised Approach for Developing Sustainable Solutions for Future Food Production

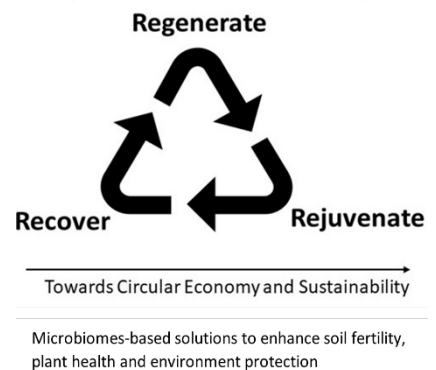
Dr. Pavagadhi Shruti
NUS Environmental Research Institute (NERI), NUS

Abstract

Rapid urbanisation and globalisation have led to enormous changes in our environmental ecosystems. Globally, there has been a paradigm shift in the way food is produced and consumed. With 9 billion of us by 2050, we would have tripled the rate of resource-use and we will need 50-70% more resources to produce enough food while adopting sustainable means to protect the environment.

In our group we have been studying such complex problems in diverse environmental systems using systematic and integrated approaches. This talk will provide a snapshot to some of our multi-disciplinary research programme that seek to provide a deep understanding of the mechanisms in environmental ecosystems. The unique features of the programme and their underlying framework which includes learning from microbial ecology, plant biology, microbiology, material sciences and integrative systems biology will be presented. The talk will also highlight the importance of multi-stakeholder initiatives involving key partners from industries, academic institutions, and government agencies.

Microbiomes for Future Farming



About the speaker



Dr. PAVAGADHI Shruti finished her postgraduate training in Food Science and Nutrition from University of Delhi, India. She was associated with some of the biggest fast moving consumer goods (FMCGs) and premier food research institutes in India. She pursued her doctoral studies on emerging environmental concerns and global challenges at NUS. Currently, she is working on integrated urban farming solutions for sustainable crop production in Singapore. She is managing several projects in the domain of agricultural and environmental ecosystems. She frequently interfaces with local urban farmers, governmental agencies and other academic departments. She has over 10 years of research expertise in multi-disciplinary areas from farm-to-fork.



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Webinar 2
24 June 2021, Thursday
1600 – 1700 (SGT)

A Waste-derived Hydrogel: Towards Sustainable Farming through Minimising Water Leakage and Nutrient Loss

Dr. Wee Kee Tan
NUS Environmental Research Institute (NERI), NUS

Abstract

Water is critical for plant growth. Shortage of water during drought causes substantial decline in crop yield. About 70% of the world's freshwater is being utilised in agriculture with majority coming from unsustainable underground reserves. Sourcing for alternative approaches that can minimise excessive leaching of water and nutrients from the soil substrate might be the key to reducing unnecessary water and nutrient wastage and help to alleviate the unintended adverse environmental impact and ensure adequate food supply.

Our team has adopted a waste-to-resource approach, developing an innovative technology to convert soybean waste (okara) to a superabsorbent hydrogel that holds significant amount of water, and can be used as a soil supplement for plant cultivation. In this talk, I will share with you our recent findings on the efficacy of this environmental friendly bio-based hydrogel in vegetable cultivation, that could avoid excessive water usage and nutrient loss owing to global warming.



About the speaker



Dr. Wee Kee TAN is a Senior Research Fellow at the NUS Environmental Research Institute (NERI). She is a plant biologist by training and has considerable experience in plant research. She is currently working on vegetable cultivation and urban farming with a multi-disciplinary team aiming to provide sustainable solutions for future food production. Through the NUS Graduate Research Innovation Programme (NUS GRIP), she and her colleague founded NuSoil Pte. Ltd., a deep-tech start-up with a mission to promote waste-to-resource recycling in support of sustainable urban farming. Dr. Tan will share with you some of their recent findings on their waste-derived hydrogel on vegetable cultivation.



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Webinar 3
25 June 2021, Friday
1600 – 1700 (SGT)

Biotransformation of Food Processing Wastewater into Microalgae-based High Value-added Products

Dr. Sheetal Kishor Parakh
NUS Environmental Research Institute (NERI), NUS

Abstract

Food processing industries are one of the largest consumers of water in the manufacturing sector. Wastewater generated from food processing applications contains a significant amount of valuable organics and nutrients. On one hand, disposal of such wastewater without proper treatment could create serious environmental problems. On the other hand, the existing wastewater treatment processes may not recover the valuable components from the food processing wastewater. Our circular economy solution to this problem is to recycle the food processing wastewater to cultivate protein-rich microalgae and return clean water in the process. The microalgae biomass can then be processed and sold as functional food, nutritional supplements, and feed additives. Unlike industrial and municipal wastewater, the nontoxicity of food processing wastewater makes it a potential nutritional resource that can be turned into high value-added products.

About the speaker



Dr. SHEETAL K. Parakh is on a mission to find micro solutions for macro problems in the water-food nexus. She is a Research Fellow at the NUS Environmental Research Institute (NERI), NUS where her research interests are water treatment, algal biotechnology, waste to resources, and membrane photobioreactors. She is currently working on building a sustainable supply of microalgal protein by valorising waste-by-products generated at local food processing industries. Dr. Sheetal holds a bachelor's degree in Chemical Engineering from the Institute of Chemical Technology (Formerly UDCT), India, and completed her Ph.D. in Chemical and Biomolecular Engineering at NUS.



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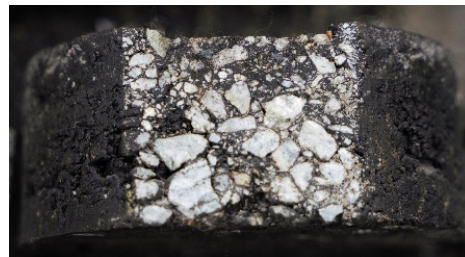
Webinar 4
28 June 2021, Monday
1600 – 1700 (SGT)

Waste Plastics on Roads: Potentials, Challenges and Building a Circular Economy

Associate Professor Raymond Ong Ghim Ping
Department of Civil and Environmental Engineering,
Faculty of Engineering, NUS

Abstract

Many countries have started exploring the use of waste plastics on roads. However, many of these applications are highly localised and urban cities in developed countries have yet fully embraced this concept. What are the main challenges and concerns that these cities faced and how could this be overcome? How can we achieve true circular economy for waste plastics on roads?



Asphalt sample with waste plastics wet-mixed into bitumen.

This webinar shall explore the potentials of using waste plastics on roads from a technical viewpoint, the potentials it may hold in reducing waste plastics destined for the landfill, why it has yet become fully embraced in developed countries (and especially in urban cities), how such challenges can be overcome, and how a true circular economy can be achieved in adopting waste plastics on road through an engineering and scientifically proven approach, while adopting a socially-responsible and environmentally-conscious attitude.

About the speaker



Dr. ONG Ghim Ping Raymond is an Associate Professor and Associate Head (Research) at the Department of Civil and Environmental Engineering, NUS. He graduated with a B.Eng (Civil) (First Class Honours) with a minor in Business and his PhD in Civil Engineering from the National University of Singapore, and completed his postdoctoral training at Purdue University, USA. Dr. Ong's research interests include pavement materials and engineering, and multimodal transport infrastructures and operations, with emphasis on future mega-transport infrastructures/operations. He has won several international awards including the prestigious American Society of Civil Engineers Alfred Noble Prize.



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Webinar 5
29 June 2021, Tuesday
1600 – 1700 (SGT)

From Waste to Value: Advanced Carbon and Metal Products Derived from Industrial Carbon Waste

Dr. Zhiyi Yao and Dr. Cadiam Mohan Babu
CBE Eco-Solutions Pte. Ltd. (A NUS Spin-off Company)

Abstract

A huge amount of carbon waste by-product is produced from oil refinery plants. In Singapore, over 50 tons of the carbon waste are burnt daily in incineration plants with the ash sent to landfills. This process emits huge amounts of greenhouse gases. Toxic metals that are present in the ash may also leach into the environment while resting in the landfill. In Singapore, our innovation also addresses the pressing need to extend the life of Semakau landfill.

Our green technology can extract vanadium and carbon from the carbon waste and convert them to vanadium pentoxide and activated carbon, respectively. Vanadium pentoxide is commonly used in the manufacturing of alloy and ceramic. Activated carbon could be used in wastewater treatment, air purification and as carbon electrode for energy storage systems. In addition, we are also testing on replicability of our solution using waste carbon collected from other sources.

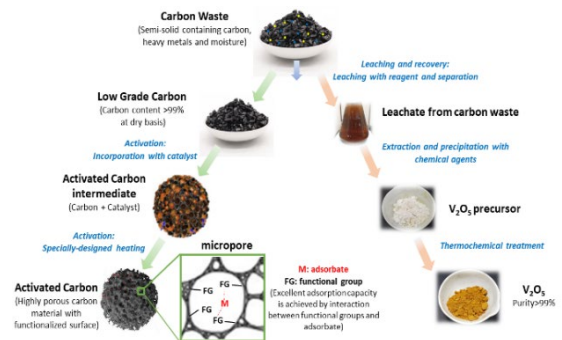
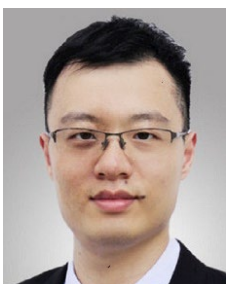


Figure 1: From Waste to Value: Advanced Carbon and Metal Products Derived from Industrial Carbon Waste

About the speakers



Dr. Zhiyi YAO and Dr. Cadiam Mohan BABU are the Chief Executive Officer and Chief Technology Officer of CBE Eco-Solutions Pte. Ltd., a spin-off company of NUS, respectively. Dr. Yao obtained his PhD degree from Chemical Engineering Department, NUS in 2018. He has seven years of research experience in process design and optimisation of waste-to-resource process. Dr. Yao also has a strong network in China's activated carbon market.



Dr. Babu has eight years of research experience in inorganic material synthesis for environmental applications such as water treatment, air purification and waste to value-added materials. He obtained his PhD degree from Department of Chemistry, Anna University in 2014. He worked as a researcher in Hanseo University (South Korea), KU Leuven (Belgium), NUS (Singapore) and Anna University (India) in the field of carbon based nanomaterials.

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Webinar 6
30 June 2021, Wednesday
1600 – 1700 (SGT)

Simulation of Wastewater Treatment using Hybrid Model

Dr. Ching Kwek Pooi
NUS Environmental Research Institute (NERI), NUS

Abstract

Activated sludge process is a widely used biological process in wastewater treatment, being able to treat different types of wastewater. Many mathematical models had been developed to evaluate and predict its treatment performance. Modeling is a useful tool in wastewater treatment, assisting engineers in plant design and operation. Two types of models are commonly used in wastewater treatment, namely mechanistic model and statistical model.

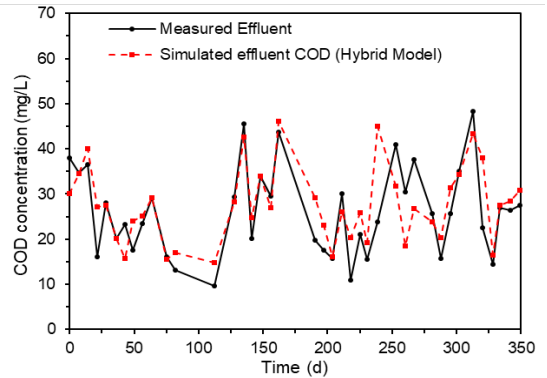
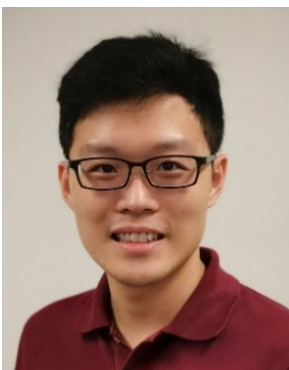


Figure 1. Measured vs simulated effluent COD of MBR treating municipal wastewater

In this study, the use of hybrid model to predict wastewater treatment is investigated. Hybrid model is a combination of mechanistic model and statistical model, harnessing the merits of both types of model. In this hybrid model, the mechanistic model provides the fundamental calculations while the statistical model corrects the error of mechanistic model. Using half a year of data to train the model, the model was applied to simulate the treatment performance of a MBR. Despite having limited data, the hybrid model was able to achieve accurate simulation results.

About the speaker



Dr. Ching Kwek POOI is currently a Research Fellow at NUS Environmental Research Institute (NERI), National University of Singapore. He conducted his Ph.D research under the supervision of Professor How Yong Ng at Department of Civil and Environmental Engineering, NUS. He was conferred Ph.D (Environmental Engineering) Degree in June 2020. During his Ph.D program, he developed a model to predict the performance of petrochemical industrial wastewater treatment. The model predicts the biomass growth, nitrification and denitrification rate, organics removal as well as the active biomass within the system. He used a combination of laboratory experiments and numerical simulations to validate the models and applied the models to make field-scale predictions. Currently, he is investigating the application of hybrid model for the optimisation of wastewater treatment plants.



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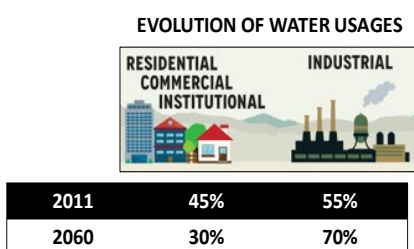
Webinar 7
1 July 2021, Thursday
1600 – 1700 (SGT)

Dealing with Hard-to-Treat Industrial Wastewater

Associate Processor Olivier LEFEBVRE
Department of Civil and Environmental Engineering,
Faculty of Engineering, NUS

Abstract

In Singapore, more than 50% of the water demand is used by the industry and this proportion is expected to reach 70% by 2060. The treatment of industrial wastewater is a challenge, especially for highly concentrated streams generated by various sectors, such as chemical and petrochemical, pharmaceutical, microelectronics, etc. Conventional techniques relying on biological methods often prove ineffective to deal with the toxicity associated with the many chemicals present in industrial wastewater and in most cases incineration remains the only option, despite prohibitive costs.



Electrochemistry is increasingly regarded as a core science for developing a sustainable society, from clean transportation to space technologies. Waste electrochemical oxidation is the new frontier. NUS researchers focus on electrochemical advanced oxidation – based on the hydroxyl radical technology – as the most promising technique to degrade and mineralise the complex organics present in hard-to-treat high COD industrial wastewater under ambient conditions, a process sometimes referred to as cold incineration. The focus will be on real applications for the industry.

About the speaker



Dr. Olivier LEFEBVRE is an Associate Professor in the Department of Civil and Environmental Engineering. His research work is in electrochemical technologies and advanced oxidation processes for industrial wastewater treatment and reuse. He is also an adjunct Professor at the Research Institute of Mines and Environment of the University of Quebec in Abitibi-Témiscamingue (UQAT). Dr. Lefebvre is an editor for Water Science & Technology and an IWA Fellow, administrator, newsletter editor and webmaster for the specialist group on water reuse, within the International Water Association (IWA). An agronomic engineer by formation, Dr. Lefebvre obtained his Ph.D. from Supagro Montpellier (France) in 2005, on a collaborative work between the French National Research Institute for Agricultural Research (INRA) and the Anna University in Chennai, India. The topic was related to biological treatment of tannery wastewater.

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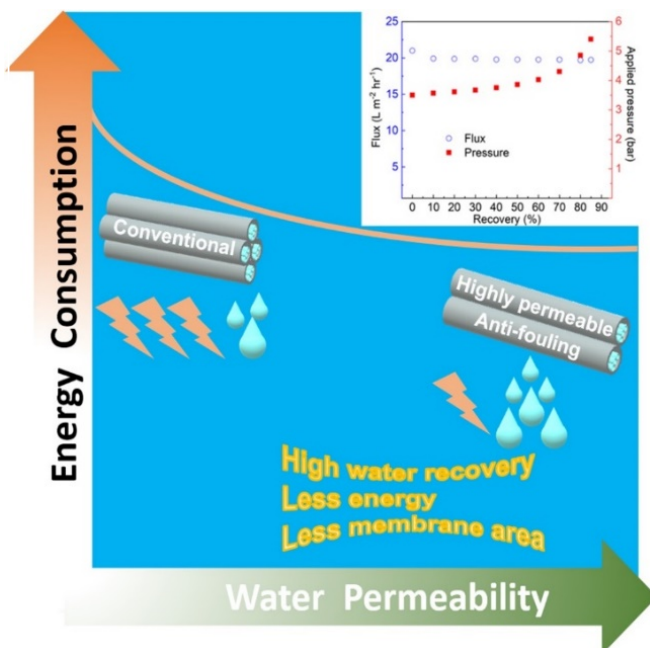
Pre-recorded Presentation 1

Highly permeable, fouling-resistant hollow fiber reverse osmosis membranes for energy efficient wastewater desalination

Assistant Professor Sui Zhang
Department of Chemical and Biomolecular Engineering,
Faculty of Engineering, NUS

Abstract

Desalination of municipal and industrial wastewater sources is critical for the sustainability of modern city and our planet. Though membrane technology has been identified as the key technology for such applications, higher energy efficiency and fouling resistance remain two challenges. Through a benign free radical polymerisation in water, zwitterionic anti-fouling polymers were synthesised and chemically bonded to the selective layer of membranes. The water permeability of resulting hollow fiber reverse osmosis membranes is thus boosted by > 40% to 7-10 LMH/bar at NaCl rejection of 98.4%. Excellent fouling resistance is demonstrated when treating local membrane bioreactor (MBR) filtrate. With process design, 85% water recovery has been achieved at the energy saving of >45%.



About the speaker



Dr. Sui ZHANG is an Assistant Professor in the Department of Chemical and Biomolecular Engineering, National University of Singapore (NUS). She received her bachelor's degree from Fudan University in 2008, and Ph.D degree from NUS in 2012. Then she worked as a postdoc at NUS and MIT until 2017.

Her current research focuses on engineering membrane transport for water, energy and sustainability. Specifically, her research mainly involves development of emerging materials with novel transport pathways, and control of surface morphology for enhanced transport. She has published > 50 journal articles with an H-index of 27 and holds 3 patents. She is the early career editorial board member for Journal of Membrane Science and Chinese Chemical Letters.

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Pre-recorded Presentation 2

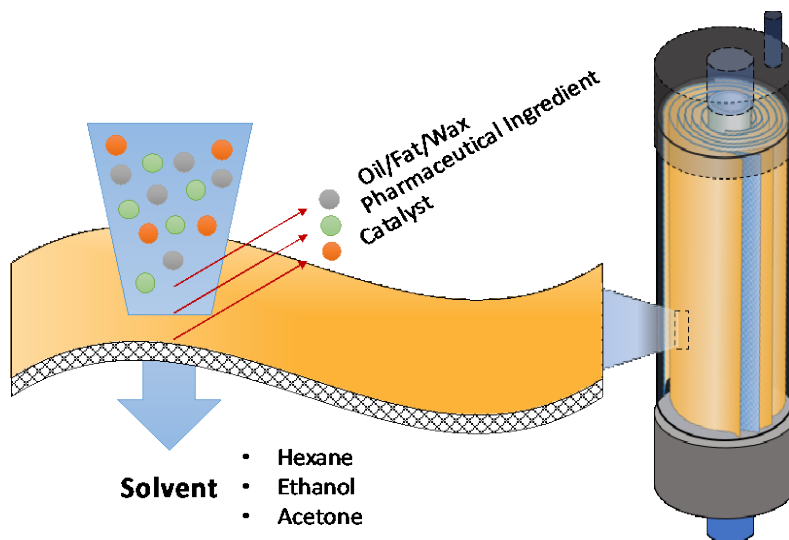
Membrane Technology for Sustainable Solvent Recovery

Dr. Chunfeng Wan

Cofounder and CEO of Solv8 Technology (a NUS Spin-off Company)

Abstract

SOLV8 Technology, a spinoff company from National University of Singapore, aspires to make industrial organic solvent separations more energy-efficient and more sustainable. We have invented a novel membrane filtration technology to recover high-purity solvents with high separation efficiency, enabling the solvents to be reused in the process. Our solvent-resistant membrane is made from food and drug grade material, and demonstrated excellent solvent flux and selectivity. The membrane has been tested for various industrial applications, such as recycling solvent from the edible oil solvent extraction process, separation of homogeneous catalyst from solvent, and concentration of food and pharmaceutical ingredients. The modular design of the membrane system makes the technology easy to scale, flexible in capacity and footprint, and ready for quick deployment. With our patent application filed in Singapore, we strive to cut the energy consumption and carbon footprint of separation processes by 90%.



About the speaker



Dr. Chunfeng WAN is the cofounder and CEO of Solv8 Technology. After 10+ years in developing and commercialising new membrane technologies, he founded Solv8 technology together with Dr. Shi Guimin, with a shared vision to make industrial solvent separation more sustainable. He has published 1 book, 30 journal articles and 2 patents on membrane technologies. He has been recognised as Forbes 30 under 30, and MIT Technology Reviews Innovators under 35.

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Pre-recorded Presentation 3

Intelligent Integrated BioSensor (I2BioS) for real-time monitoring of heavy metals and cyanide in Sewer Network and Water Resources.

Dr. Shailesh Kharkwal

CEO & Co-Founder of EnvironSens (a NUS Spin-off Company)

Abstract

I2BioS, intelligent integrated biosensor system, invented by the founders of EnvironSens at the National University of Singapore, monitors toxicity (heavy metals) in used water networks in real-time and on 24x7 basis; hence, protects downstream biological treatment at Water Reclamation Plants and Water Resources. 100 units of I2BioS have been successfully installed in Singapore by PUB, Singapore's National Water Agency for protecting sewer network and NEWater plants against high concentrations of heavy metals and cyanide. More than 10 cases of illegal discharges have been detected by I2BioS in Singapore. EnvironSens is looking forward to installing I2BioS as an early warning system to monitor illegal discharge in Asia, Australia and Europe in the near future. For its unique sensor technology, EnvironSens has won several global and regional awards, such as IES Prestigious Engineering Achievement Awards and IWA Asia Pacific Project Innovation Award, etc.



About the speaker



Dr. Shailesh KHARKWAL is the CEO & Co-Founder of EnvironSens.

Dr. Kharkwal received his Ph.D from NUS and has over 10 years experience in water quality monitoring and wastewater treatment technologies and products.

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