NEWRI UPDATE 2016

- ISSUE 9 -

Stay Connected with NEWRI – Your Global Research & Technology Partner

NEWRI's Pavilion at Singapore International Water Week (SIWW) 2016 was visited by Minister for the Environment and Water Resources Mr Masagos Zulkifli (pg2)

In this issue:

Singapore's first Waste-to-Energy Research Facility launched at Clean Enviro Summit Singapore (CESS) 2016. (Pg 4)

NTU's Lyon was on hand to help promote NEWRI @ SIWW and make new friends.

NANYANG TECHNOLOGICAL UNIVERSITY

Nanyang Environment & Water Research Institute

NEWRI ECOSYSTEM
Your Global Research & Technology Partner

A word from the Prof...

Dear Colleagues and Friends of NEWRI,

We will celebrate the nation's 51st birthday in the coming days, and it is also an exciting time for NEWRI.

We begin this newsletter with a peek at this year's Singapore International Water Week (SIWW) and our involvement. Our participation at this year's SIWW saw many exciting happenings at the NEWRI Pavilion, and what an exciting week it was: NEWRI spinoffs signing on various partnerships in the wastewater and energy recovery sector, official launch of the Waste-to-Energy Research Facility, and a public show at NEWRI's RED (Research, Engineering and Deployment) approach.

NEWRI has also had news coverage in the recent weeks. News on our energy-saving nano-filtration membranes from SMTC, as well as AEBC's way to derive useful chemicals from food waste. These were featured along with Prof Wang Rong and Prof Liu Yu. The launch of Singapore's first Waste-to-Energy Research Facility at Clean Enviro Summit Singapore (CESS) 2016 was also well featured. We are also no less proud of our students, Dharma Sree, Joshua Oh, Goh Jing Yaw, Lee-Jian Yuan and Zhao Jie on their achievements and awards received.

In our NEWRIComm Photo-essay, we bring you the Bio-gas project in Nagpur, India, which has been handed over to the beneficiaries.

Lastly, we bid you a great weekend and a happy 51st National Day!

Prof Ng Wun Jern
Executive Director, NEWRI
NEWRIUpdate

Main Feature!

NEWRI @ SIWW; NEWRI participated in the 7th Singapore International Water Week (SIWW) held in conjunction with the 5th World Cities Summit (WCS) and the 3rd CleanEnviro Summit Singapore (CESS), from 10 – 14 July 2016 at the Sands Expo and Convention Centre, Marina Bay Sands in Singapore.

What-a-week-it-was!

The 7th Singapore International Water Week was held in conjunction with the 5th World Cities Summit (WCS) and the 3rd CleanEnviro Summit Singapore (CESS), from 10 – 14 July 2016 at the Sands Expo and Convention Centre, Marina Bay Sands in Singapore.

Over the 4 days, NEWRI's pavilion drew interest and praise, drawing trade visitors, guests and academic delegates from various countries.

Many questions were asked as guests found NEWRI's structure and operations unusual. Our theme "*Expressway to Innovation and Enterprise*" this year captured the attention of many visitors, all curious about our showcase of the development of **NEWRI's RED (Research, Engineering and Deployment)** philosophy since its inception in 2008 to how we have been steadfast with our vision to bring the right kind of partnerships to greater heights.

Amidst our booth were displays that highlighted our expertise in domains of Bioprocesses, Novel Membranes, Sensing & Modelling, Waste to Energy, Process Treatment, Sensing and Materials. Amongst the visitors, our pavilion also hosted MEWR Minister Masagos Zulkifli, along with the chairman of SIWW – Mr Bernard Tan.

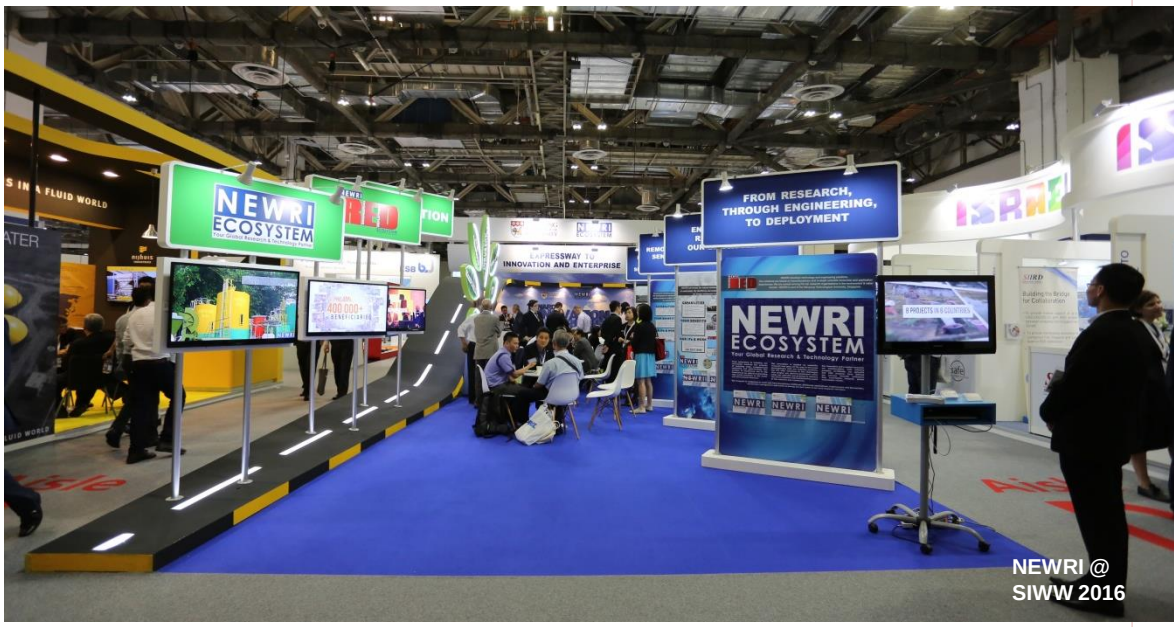
Our participation at this year's Singapore International Water Week (SIWW) saw many happenings at the NEWRI Pavilion and what an exciting week it was: collaborative signings between various partners and NEWRI spin-offs occurred. NTU's mascot 'Lyon' traversed the World Cities Summit alerting delegates to our presence.

For more images of the NEWRI pavilion at SIWW 2016, Click Here

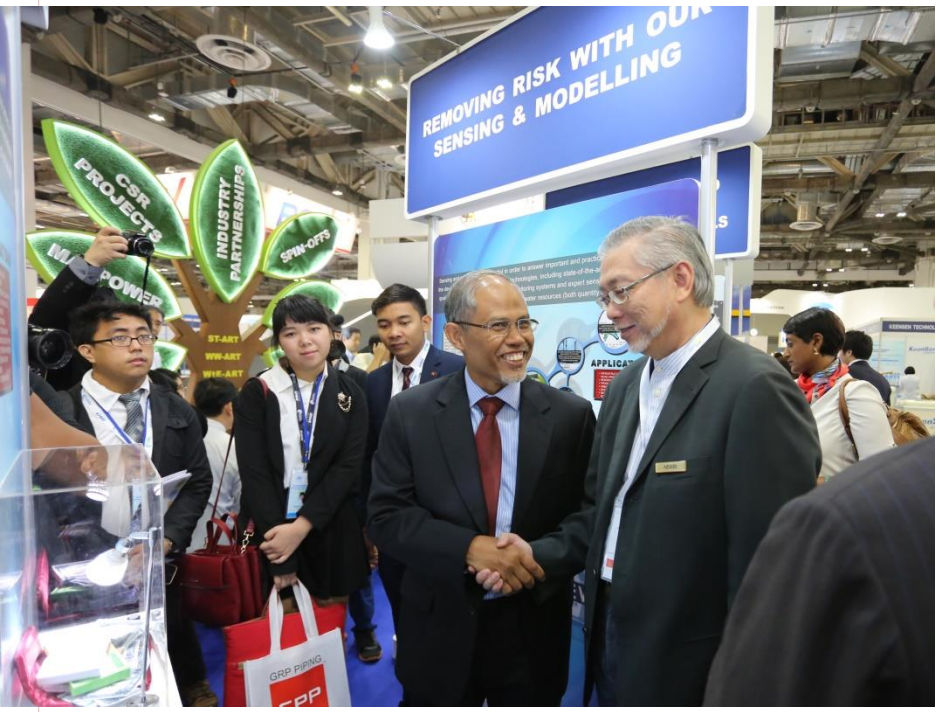

NEWRI @ SIWW 2014


NEWRI @ SIWW 2012

NEWRI has been participating since the 1st SIWW and 2016 would be our 7th year in participation

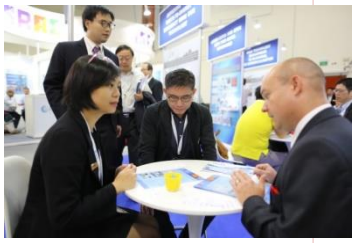


NEWRI @ SIWW 2016



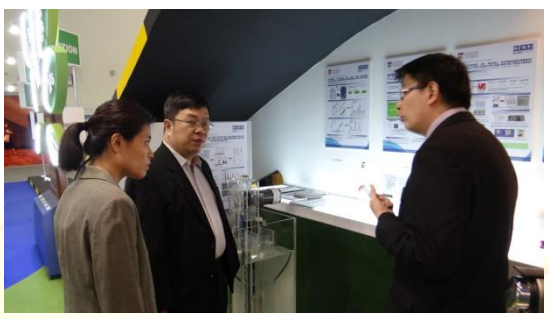
Minister for the Environment and Water Resources Mr Masagos Zulkifli meets Prof Ng Wun Jern, Executive Director NEWRI at the NEWRI pavilion at SIWW 2016




Prof Lam Khin Yong (NTU Chief of Staff and Vice President (Research)) also graced our pavilion with his presence. Many visitors were curious about our unique booth design and its exhibits.




Business meets were constant as the booth was also a gathering area for potential partnership discussions.

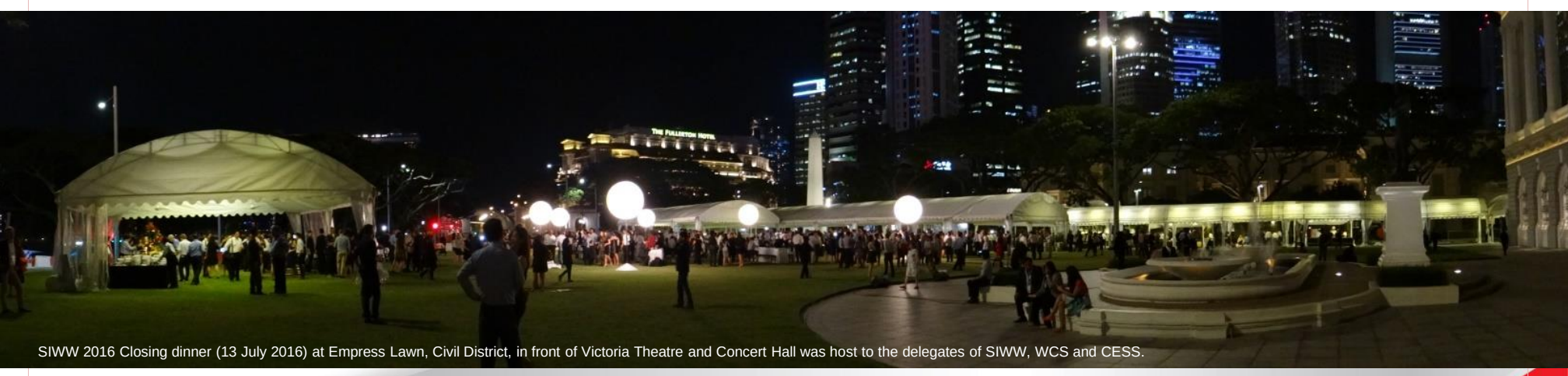




The NEWRI pavilion at SIWW 2016 was host to many visitors from near and far and these were met enthusiastically by NEWRI.

Minister for the Environment and Water Resources Mr Masagos Zulkifli also took the time to visit the ST-ART booth at the PUB Water Innovation Pavilion (Level 1) where he was met by Dr Adil Dhalla, Managing Director of ST-ART

NTU's mascot 'Lyon' was on hand to promote NEWRI & NTU. Garnering a lot of attention at different levels within MBS, Lyon received much praise and smiles from delegates & guests alike.

All too soon, SIWW 2016 had to come to an end. But not without a fantastic closing ceremony to end off 3 days of conferences, exhibitions and meetings.



SIWW 2016 Closing dinner (13 July 2016) at Empress Lawn, Civil District, in front of Victoria Theatre and Concert Hall was host to the delegates of SIWW, WCS and CESS.

Waste-to-Energy Research Facility launched at CESS 2016

(From Left to right: Mr S Satish Appoo (Group Director – Joint Ops & Technology, NEA), Mr Khoo Seow Poh (Deputy CEO, NEA), Mr Ronnie Tay (CEO, NEA), Mr Choi Shing Kwok, (Permanent Secretary, MEWR), Prof Freddy Boey (Provost, NTU), Prof Ng Wun Jern (Executive Director, NEWRI), Prof Victor Chang (NEWRI), Dr Babu Narayanswamy (NEWRI)

Mr Choi Shing Kwok, (Permanent Secretary, MEWR) addressing the audience in his welcome address

Mr Ronnie Tay (CEO, NEA) and Prof Ng Wun Jern (Executive Director, NEWRI) signed the collaborative agreement, witnessed by Mr Choi Shing Kwok, (Permanent Secretary, MEWR) and Prof Freddy Boey (Provost, NTU).

Singapore's National Environment Agency has signed a Collaboration Agreement with Nanyang Technological University to co-fund the development of a S$40 million (~US$29.6 million) waste-to-energy (WTE) research facility.

The first of its kind in Singapore, the facility will enable the translation of emerging WTE technologies from research to demonstration and test-bedding. The facility is Expected to be commissioned by late 2018, the demonstration plant will also be a test-bed for new types of WTE technologies, such as converting biomass waste into synthetic gas that can supplement the energy usage of the plant and to convert ash to slag.

NTU's Nanyang Environment and Water Research Institute (NEWRI) will operate and maintain the facility over the next 10 years, and use the platform to conduct research, demonstrations and run test-bedding projects.

Mr Ronnie Tay (CEO, NEA) said, "This collaboration underscores NEA's commitment to support Singapore's move towards being a zero waste nation. We hope that this facility will provide all stakeholders with the tools and opportunities to strive for more effective and sustainable waste management solutions through research, development and demonstration work."

Prof Victor Chang addressing the press on questions about the WtE Research Facility.

Prof Ng Wun Jern (Executive Director, NEWRI) sharing insights with the press.

Mr Ronnie Tay (CEO, NEA) being interviewed by media

PARTNERSHIPS / NEW RESEARCH

NEWRI's continues to push into valued-added solutions , defining our journey towards enterprise and contributing to global sustainable economic values, in our on-going effort to bridge innovation and enterprise.

"Spanning the whole gamut of water and environmental technologies, from clean water purification to advanced waste-to-energy biogas production, these spin-offs proudly represent NTU-NEWRI and Singapore in research outcomes and applications at home, and overseas, reinforcing Singapore's position as a global hydro hub."
Prof Ng Wun Jern

NEWRI SIGNS WITH PARTNERS ON NEW COLLABORATIONS

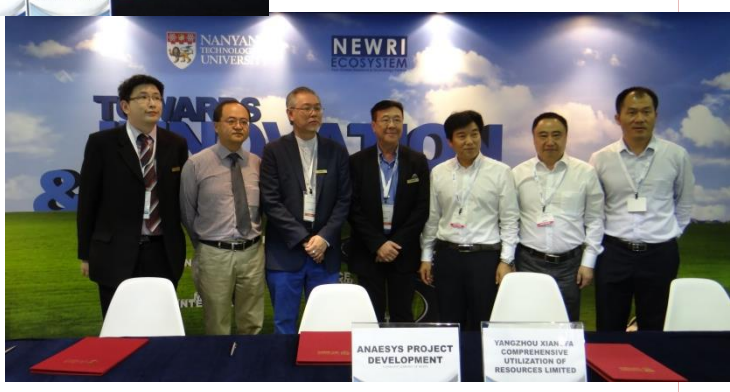
Apart from the many visitors, meetings and discussion were also held on site, along with a number of important collaborative agreements signed over the course of the days. NEWRI and its water and environmental technology spin-offs from Nanyang Technological University, Singapore, (NTU Singapore) have signed agreements with industry partners targeting projects worth up to $300 million.

These spin-offs from NTU's Nanyang Environment and Water Research Institute (NEWRI) are results of the effort to connect research and innovation to tangible real-world applications. Over the course of the week, 10 agreements were signed by NEWRI and its five spin-off companies with industry partners from China, East Asia, Europe, India, and Southeast Asia.

Professor Ng Wun Jern, Executive Director of NEWRI, said investments into research have to generate results beneficial to the community and industry without which research becomes an unsustainable activity, and these spin-off companies are examples of how valuable research can become when made relevant to industry. Areas of interest of Industry projects clinched include:

1) Agricultural waste management projects
2) Decentralised sanitation systems
3) Toxic waste and solid waste management via incineration
4) Upgrading of wastewater treatment plants
5) Zero Liquid Discharge systems
6) Recovery of precious materials from industrial solid and liquid waste
7) Soil Rejuvenation, turning waste into high grade organic fertilisers

Yangzhou Xiangfa Comprehensive Utilization Of Resources Limited & **NEWRI** signs MoU to develop new technologies. (left)



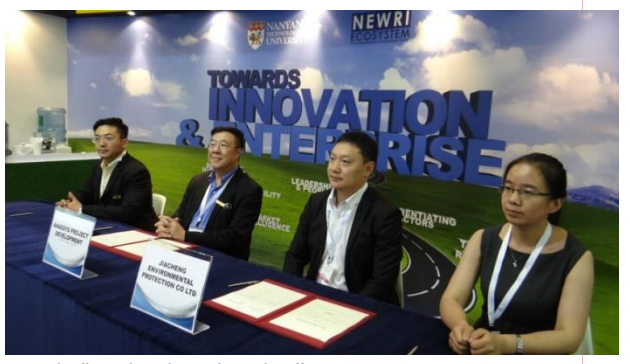
Yangzhou Xiangfa Comprehensive Utilization Of Resources Limited & **Anaesys Project Development Pte Ltd** signs contract to develop new technologies. (right)

Kiat Lee Landscape & Building Pte Ltd & **NTU NEWRI** signed RCA (left) for a research collaboration agreement.

STC (Shah Technical Consultants) & **Anaesys Project Development Pte Ltd** signed **MoU.**

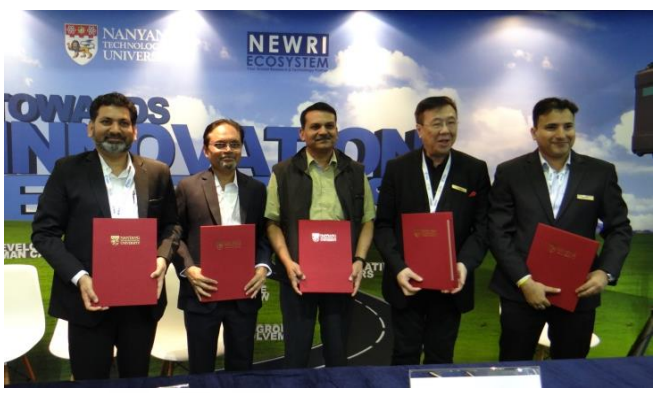
Contract between **Wanji Biotech Co. Ltd**. & **Phytosys Pte Ltd** (NEWRI's spin-off company) signed.

A Singapore company, **YFE Pte Ltd (a Lee Kim Tah subsidiary**), together with NEWRI through its spin- off, **R3Sys Pte Ltd**, signing a collaborative agreement



Tianjin University major spin off, ***JIACHENG ENVIRONMENTAL PROTECTION CO LTD*** , started by Dr Li Yong Tian, Deputy Chairman of Environment Science and Engineering Research Institute of Tianjin University, has agreed to collaborate with **NEWRI** (through its spin-off **ANAESYS PROJECT DEVELOPMENT**) to deploy NEWRI IPs commercially in China.

Ceraflo (Singapore)Pte Ltd, manufacturer of one of world's thinnest ceramic membranes, to collaborate with **Membrisys Pte Ltd**, a NEWRI spin-off.



MoU signed between **Membrisys Pte Ltd** , **Nurture Earth** and **Bajaj Auto Ltd** for zero liquid discharge plants.

Collaborative agreement between **UES Holdings Pte Ltd** and **Anaesys Project Development** signed for various projects regarding agricultural and animal waste management are in planning to explore development in Shijiazhuang (with Kangfeng), Haicheng (with High Fame), and Bozhou (with Colintec).

PARTNERSHIPS / NEW RESEARCH

NEWRI's continues to push into valued-added solutions , defining our journey towards enterprise and contributing to global sustainable economic values, in our on-going effort to bridge innovation and enterprise.

MOU SIGNED BETWEEN RAMBOLL ENVIRON SINGAPORE PTE LTD & NTU-NEWRI FOR COLLABORATION IN R&D.

The signing formalises the collaboration in research and development with the intention of culminating in a joint Centre of Excellence that focuses on solid wastes management to address not only the Singapore market, but also the region.

SEMINARS, WORKSHOPS AND TRAINING

NEWRI constantly seeks to enhance staff knowledge and experiences. Regular in-house workshops and seminars by fellow researchers and visiting professors, scientists and institutes allows knowledge to diffuse throughout the organisation. These were some events in 2016.

1.	Steam Gasification of Lignocellulosic Biomass and Catalytic Tar Reforming Seminar
2.	INES workshop "Upscaling the Production of Innovative Membranes" in Singapore (NTU)
3.	Fungal Biomes and Diversity and Human Health Implications (@ CEE)
4.	The Reinvention of Sanitation Services
5.	From Waste Treatment To Valuable Products Production
6.	ZeeLung: A new membrane-aerated biofilm reactor for low energy wastewater treatment
7.	Microbial functional diversity predicts groundwater contamination and ecosystem functioning
8.	Microbial Feedbacks Mediates Vulnerability of Permafrost Carbon to Climate Warming
9.	DEWATS- Rising technical challenges & Bridging the gap from Lab to field studies
10.	Conjugated Oligoelectrolyes for Biochemical applications
11.	Antibiotic Resistant Genes as an Emerging Environmental Contaminant
12.	Biofilm Sloughing in Integrated Fixed-Film Activated Sludge (IFAS) Systems
13.	Organic Pollutants in the Water Cycle Workshop
14.	Some Recent Advances in Research of Dense Jets
15.	Strategies for biosynthesis of polyhydroxyalkanoates (PHAs) using excess activated sludge
16.	Art of Grantsmanship – Prof Wang Kuan (Taipei Medical University)
17.	Microstructure Optical Fibers, 3D Scaffold and Biofilm Engineering
18.	Stochastic Processes in microbial community assembly and Succession
19.	Removal of Intermediate Aromatic Halogenated DBPs by Activated Carbon Adsorption: A New Approach to Controlling Regulated Trihalomethanes and Haloacetic Acids in Chlorinated Drinking Water

Visit by Department of Micro- and Nanotechnology , Technical University of Denmark
(July 2016)

Fungal Biomes and Diversity and Human Health Implications by Dr. Naomichi Yamamoto (Department of Environmental Health Sciences, Seoul National University)
22 June 2016

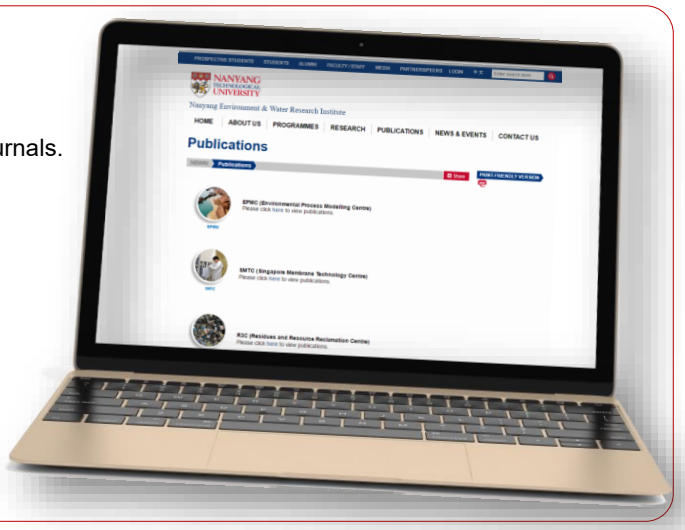
Participants of the INES (Integrated Network for Energy from Salinity Gradient) **workshop "Upscaling the Production of Innovative Membranes" in Singapore (NTU)**
(7 July 2016)

JOURNALS & PUBLICATIONS

At NEWRI we do not forget our foundation which is good science . NEWRI's researchers publish frequently in journals. You can log on to the following website for more information on articles.

Please click on link:
Click Here

NEWRI's new brochure is out now!
(Click on image to download)



AWARDS / ACCOLADES / ACHIEVEMENTS

Our congratulations to the following for their achievements.

Congratulations to CEE PhD student **Dharma Sree** for winning the Best Student Paper Award at the 23rd IAHR Symposium on Ice!

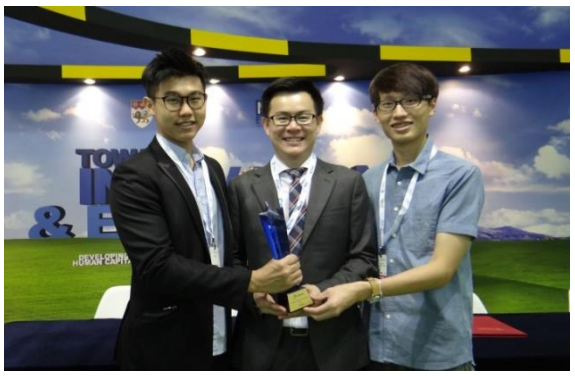
To view the articles, please click below
Media Releases from NTU

Congratulations to CEE-NEWRI PhD student Dharma Sree for winning the Best Student Paper Award at the 23rd International Association of Hydro-Environment Engineering and Research (IAHR) Symposium on Ice, held in June 2016, at the University of Michigan, USA.

The International Association for Hydro-Environment Engineering and Research (IAHR), founded in 1935, is a worldwide independent organisation of engineers and water specialists working in fields related to the hydro-environmental sciences and their practical application.

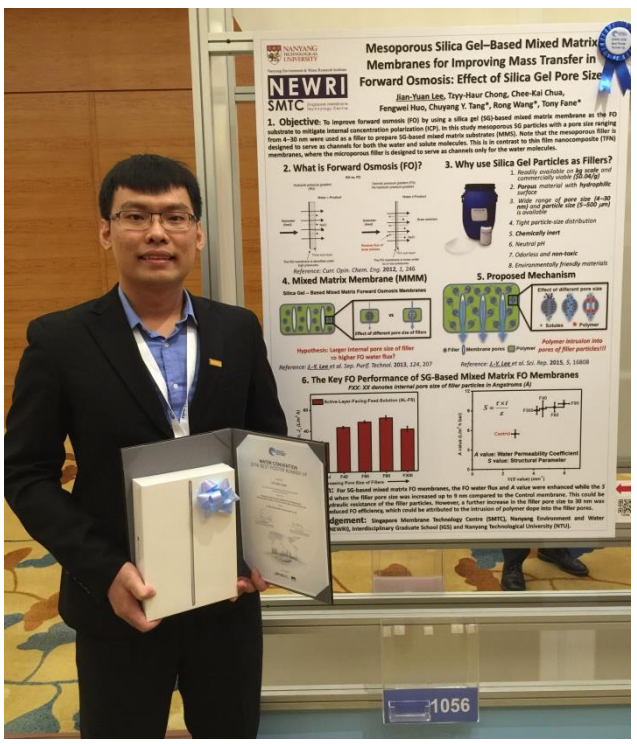
" I am really feeling happy, proud, confident and responsible after receiving the Best Student Paper Award for IAHR 2016 conference. This success was possible only with the technical support from my supervisor Assoc Prof. Law Wing Keung Adrian & Prof. Hayley H. Shen along with the facilities provided by NEWRI. The early stages of my research was tough, this positive outcome provides me the courage to move forward without any loss in enthusiasm." Best Student Paper award winner, Ms Dharma Sree K

Congratulations to CEE students **Joshua Oh and Goh Jing Yaw** for garnering the top prize at the Sembcorp Water Technology Prize 2016



To view the articles, please click below
Media Releases from NTU

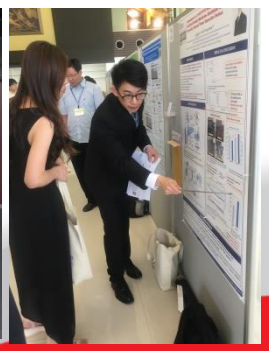
Congratulations to Joshua Oh and Goh Jing Yaw (Environmental Engineering Year 3 students)! Joshua and Jing Yaw had done CEE proud, defeating 13 other teams, and garnering the top prize of $5,000 at the Sembcorp Water Technology Prize 2016! They were presented the cash prize by Sembcorp Group President & CEO, Mr Tang Kin Fei, at the Singapore International Water Week. They have also won an internship opportunity with Sembcorp Industries. The team had received assistance from various faculty and staff members during the competition period, and wish to express their appreciation to Asst/Prof Chong Tzyy Haur (CEE/NEWRI), Asst/Prof Zhou Yan (CEE/NEWRI), Dr Wu Bing (SMTC/NEWRI), and Ms Zheng Shimin (CEE).



Congratulations to **Lee-Jian Yuan** for winning the SIWW 2016 Water Convention Best Poster Runner Up award

Lee Jian-Yuan has once again done NEWRI proud. His poster "Mesoporous Silica Gel-based Mixed Matrix Membranes for Improving Mass Transfer in Forward Osmosis: Effect of Silica Gel Pore Size" was recognised in recognition of an outstanding poster exhibitinh originality and high technical quality and managed a 'Best Poster Runner Up award' at the recent SIWW 2016 Water Convention. Our heartiest congratulations to Jian-Yuan!

Congratulations SMTC/NEWRI PhD student, **Zhao Jie** to garnering the Best Student Poster Award at AMS10



Congratulations to Zhao Jie (SMTC/NEWRI PhD) on achieving the Best Student Poster Award at the 10th Conference of Aseanian Membrane Society (AMS10) for his paper entitled "Development of PVDT/PTFE Hollow Fiber Membranes for Direct Contact Membrane Distillation via Thermally Induced Phase Separation Method".

Our heartiest congratulations to Zhao Jie!

Energy (Biogas) from Organic Waste from small communities, Nagpur, India

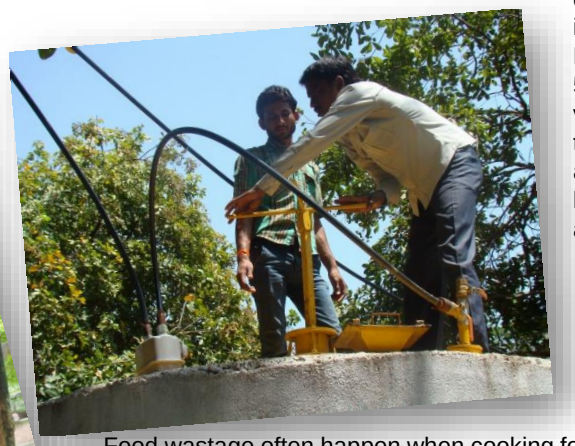
Organic waste forms a significant constituent of municipal solid waste (MSW) from developing countries, especially in South Asia. This organic fraction tend to have higher moisture and lower calorific value. Thus, incineration, which is typically found effective for managing dry (typically urban) waste, may be unsuitable to capture the energy contained in this "waste material".

On average by weight, the organic fraction of MSW in South Asia is 70%. Food waste is also an emerging issue not necessarily confined to affluent urban centres. Worldwide, about a third of food materials go to waste.

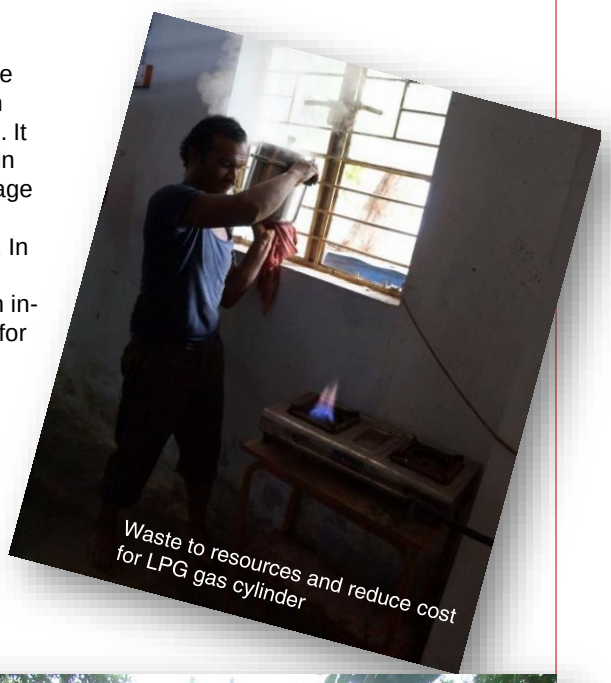
If not properly managed, organic waste can pose public health risk (e.g. through environmental contamination & breeding of pests). In many peri-urban and rural populations in developing countries, solid waste goes to open dumps, burnt in the backyard, or landfilled.

Through the Lien Environmental Fellowship program, NEWRI developed and implemented a food waste treatment facility in collaboration with the Council of Scientific & Industrial Research-National Environment Engineering Research Institute (CSIR-NEERI) and the Go-Vigyan Anushandan Kendra (GVAK), Nagpur, Maharashtra, India.

The 2stage anaerobic digester with a capacity to treat up to 50 kg food waste/ day was set up at GVAK's campus in Deolapar, a small town about 70 km northeast of Nagpur city. It helps supplement GVAK's energy requirement for cooking. The biogas produced is sufficient for two hours/ day cooking on average. The gas produced is dry and odourless (likely due to the vegetarian diet) and gives blue flame. The facility has been used and maintained by GVAK, under CSIR-NEERI's supervision. It has been in steady operation since September 2015 and produces little sludge.



GVAK is a local non-profit organisation advocating sustainable living & farming practices based on cattle (particularly cows) protection. It is based in Nagpur. Their campus in Deolapar prepare food for on average 50-100 permanent residents, staff, visitors and trainee farmer per day. In the vicinity is also a school run by a charity for poor students, with an in-house kitchen providing food daily for about 500 students.



Food wastage often happen when cooking for a large crowd. The benefiting community (GVAK campus & neighbouring school) produces 50-100 kg of cooked food waste and raw vegetable cuttings daily.

Cooked food waste treatment is still uncommon in India. While reduction of waste is still a better solution, waste management is in the meantime necessary, especially when population growth is high and land is increasingly scarce.

(Left to right)
1. Mr Prabhakar Pandit – CSIR-NEERI Research Scholars
2. Ms Madhuri Gulhane- CSIR-NEERI Research Scholars
3. Mr Goh Seng Yong – NEWRI Operations Team Engineer
4. Ms Tsen Yi Sing – NEWRIComm Assistant Development Manager
5. Mr Sunil Mansinghka, Go-Vigyan Chief Co-Ordinator
6. Mr Suresh Dawle, Go-Vigyan Secretary
7. Mr Anant Kolwadkar, Go-Vigyan Manager
8. Dr Anshuman Khardenavis- CSIR-NEERI Senior Scientist (LEF fellow)

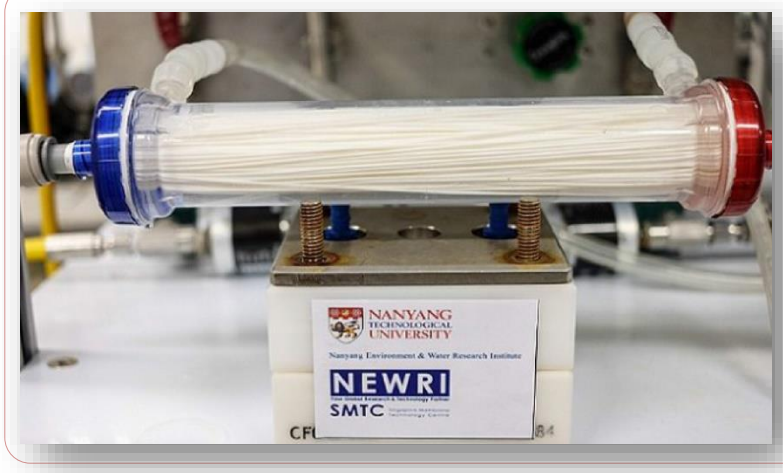
“NEA and NTU to develop waste-to-energy research facility”

Singapore’s National Environment Agency has signed a Collaboration Agreement with Nanyang Technological University to co-fund the development of a S$40 million (~US$29.6 million) waste-to-energy (WTE) research facility. The first of its kind in Singapore, the facility will enable the translation of emerging WTE technologies from research to demonstration and test-bedding. The facility is expected to be commissioned by late 2018 and will also provide manpower training to build up technical competencies in WTE domain areas. Possible demonstration and test-bedding projects to be conducted at the facility include turning waste and biomass into synthetic gas (syngas), cleaning and upgrading syngas to run a gas engine or turbine for higher energy recovery efficiency, and low-grade heat recovery. The new facility's incinerator will also reduce waste to slag - a glass-like by-product.

To view the articles, please click below

Media Releases from NTU

MyPaper Chinese, Energy Business Review, Asian Scientist Magazine,



“NTU invents energy-saving nano-filtration membranes”

Scientists at NTU NEWRI have developed a new type of nano-filter that could reduce the energy needed to treat waste water by up to 80 per cent. NTU’s NEWRI has come up with a new nano-filtration hollow fibre membrane which requires only 2 bars of water pressure. the technology, which took two years to develop, will allow the world to treat and produce extremely clean water at a low cost.

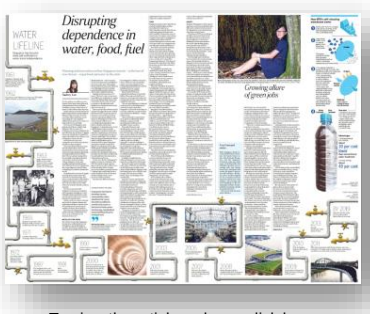
“One of the main challenges faced by industry is that current reverse osmosis processes are energy-intensive, with down-time needed for maintenance, our new membrane is also easy to manufacture, using low-cost chemicals that are 30 times cheaper than conventional chemicals, making it suitable for mass production.” said **Prof Wang Rong** (SMTC Director, NEWRI)

To view the articles, please click below

Media Releases from NTU

Asian Scientist - Nanofilter uses Less Energy to Purify Wastewater

“Disrupting dependence in water, food, fuel”


Disrupting dependence in water, food, fuel

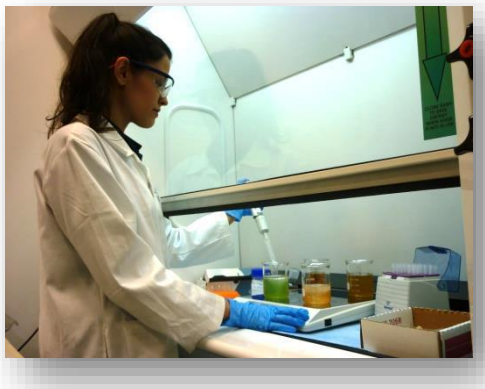
Singapore is not only steadily moving towards greater self-sufficiency in water supply, but also exporting water purification technology to countries around the world.

“Singapore is now in a good position to offer our technologies to meet the needs of other developing countries which are facing water stresses”. Quote from **Prof Ng Wun Jern** (Executive Director, NEWRI)

To view the articles, please click here

The Straits Times,

“‘Made in Singapore’ goes places”



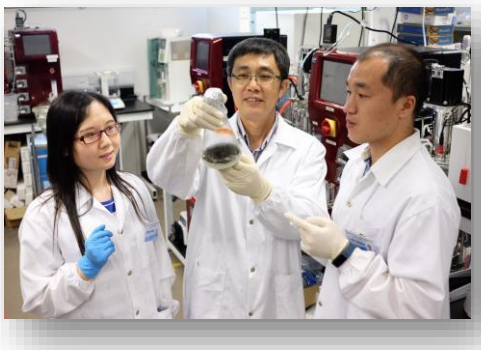
Cutting-edge water technologies are being developed and tested industry applications.

“… there is trust that things developed and tested here have a better chance of delivering the desired results..” Quote from **Prof Ng Wun Jern** (Executive Director, NEWRI)

To view the articles, please click here

The Straits Times,

“AEBC has devised a way to cut the mass of food waste by up to 90%”



Scientists from NTU-NEWRI have devised a way to cut the mass of food waste by up to 90 per cent. Led by Professor Liu Yu from the School of Civil and Environmental Engineering, the team used food waste to produce a cocktail of enzymes, which can in turn convert the waste into glucose.

“Our aim is to reduce the amount of food waste that eventually reaches the landfill,“ quote from **Prof Liu Yu** (AEBC Director, NEWRI)

To view the articles, please click here

The Straits Times

Till the next update

Happy birthday Singapore and Best Wishes