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Stay Connected with NEWRI - Your Global Research & Technology Partner
Dear Colleagues and Friends of NEWRI,

Time flies.

We have already left 2016 and are now into 2017. We did well in 2016 and our research outputs by way of publications, the IPs we have generated, the employability of NEWRI graduates, and our growing links with industry partners are indications of the progress made. With confirmation of NEWRI receiving its Tranche-3 funding, we can now push forward till 2021 before we again bid for core funding.

Last year in July, NTU organized for NEWRI to be formally evaluated. The largely positive evaluation report noted evidence of rapid progress and quality. There was, however, an unexpected observation and discussion made by the Evaluation Panel and this was of NEWRI’s uniqueness in terms of its structure and mode of operations. It is this structure and mode of operations which NEWRI is using to bring research outcomes to the community and industry.

NEWRI has now transited into the third phase of its RED (Research-Engineering-Deployment) roadmap. The careful balance of deep research and robust engineering is intended to allow NEWRI to innovate in ways meaningful to the Singapore environmental engineering industry. It is also this balance which has allowed NEWRI to have both an academic profile and an industry profile.

NEWRI, in 2017, is ready to take increasing numbers of its innovations to the industry – i.e. Deployment. As we progress through 2017, we shall undertake activities intended to move NEWRI forward and upwards.

I thank you for your support and I am certain, with you, the best that is yet to be for NEWRI.

Wishing you a prosperous RED rooster year in 2017,

Prof Ng Wun Jern
Executive Director, NEWRI
NEWRIUpdate
What would be the next step for biological treatment processes?

In biological treatment of wastewater, essentially we have never used pure cultures given the highly complex composition of wastewater. Therefore, the key issue here is not about the development of individual species, but a healthy microbial consortium with multiple functions, in which various species can survive and work in a synergetic fashion. For example, many species (e.g. ammonia oxidizer, nitrite oxidizer, denitrifying bacteria, Anammox bacteria etc) are essentially involved in the Anammox process. The main challenge is how to engineer an optimal system so that these species can all exist in kinetic equilibrium favorable for anammox reaction.

What are the biggest challenges faced by biological treatment processes? (footprint, CAPEX, sensitive to process variation, microbes behavior etc.)

We celebrated the 100th anniversary of the activated sludge process in 2014. Although the activated sludge process, one of the most remarkable engineering inventions in the 20th century, has made significant contribution to wastewater reclamation, its high energy consumption and the production of extremely huge amount of waste activated sludge pose a serious impact and challenge to the current wastewater industry worldwide, and is also inevitably linked to the issue of global climate change. We thought that substantial reduction of these two issues is crucial for the sustainability of the wastewater industry. We believe that substantial reduction of these two issues is crucial for the sustainability of the wastewater industry. This is only possible if we can turn wastewater treatment from currently energy-negative to energy-neutral or even energy-positive in future. In the years to come, we have no choice, but have to find out how to address the wastewater-energy-resource nexus.

What would be the next step for biological treatment processes?

In my opinion, there will be an urgent global need to substantially improve the overall energy efficiency of wastewater treatment plant (WWTP). Theoretically, organics in wastewater should be captured as much as possible for direct anaerobic digestion prior to biological conversion to sludge. This concept may lead to the paradigm shift of the current wastewater treatment practice to the one in which the sludge is produced in plant energy consumption and (ii) minimized production of waste activated sludge. We believe that future WWTP should be designed according to the concept of A-B process for significantly improving the energy recovery potential, while reducing in-plant energy consumption. The AEBG team has been exploring various possible configurations of A-B process. With the advances in environmental microbiology along with recent development in autotrophic ammonia removal, A-B process appears to be a feasible option towards energy self-sufficient wastewater reclamation.

What is the driving force behind WW-ART initiative?

AEBC is a leading unit in the NEWRI’s WW-ART initiative, an engineering platform for technology demonstration, which is essential for derisking and deploying technology. Indeed, NEWRI-AEBC has been working on a broad spectrum of wastewater technologies. For example, the team in NEWRI-AEBC has also developed a novel A-B process in which an anaerobic moving bed biofilm reactor (AMBBR) serves a lead A-stage for COD capture towards biogas production and an integrated fixed-biofilm and activated sludge sequencing batch reactor (TFAS-BBR) employed as B-stage for biological nitrogen removal. About 85% of COD influent wastewater can be recovered at the A-stage, while 85% of N-removal was achieved when the stable nitrite shunt was established at the B-stage. More importantly, NEWRI-AEBC has patented an innovatively designed degasser for recovery of dissolved methane from anaerobic effluent, by which 90% of dissolved methane in the A-stage effluent could be recovered. Compared to the conventional activated sludge process, the production of waste sludge in this A-B process can be reduced by about 75% due to the efficient COD capture at the A-stage, leading to significant energy savings from aeration for COD oxidation and post-treatment of waste sludge.

AEBG is a leading unit in the NEWRI’s WW-ART initiative, an engineering platform for technology demonstration, which is essential for derisking and deploying technology. Indeed, it is an excellent example of the NEWRI’s RED philosophy, i.e. Research, Engineering and Deployment. Definitely, with the unique WW-ART platform in place, NEWRI-AEBC shall be able to engineer and further develop their IPs into markets in an accelerated pace.

What was the driving force behind WW-ART initiative?

The TRLs of most IPs generated in laboratories are very low, generally below 4. This is becoming a serious hurdle of the IPs deployment and commercialization. We believe that deriving of IPs with TRL 4 is an essential step towards final technology deployment and commercialization. Precisely, the WW-ART initiative can help to fill up such a gap in technology development between laboratory and industry.

What would your message to potential researchers who intend to pursue this field?

In 2014, when people around the world celebrated the 100th anniversary of the activated sludge process, a fundamental question of what is the next 100 years of wastewater treatment has been raised. In my humble view, to address such a challenging question, we shall need to make sure that deep science must lead to deep engineering in future. Therefore, a future successful researcher should possess adequate scientific and engineering capability in addressing complex environmental issues.
KURITA (SINGAPORE) PTE. LTD visits NEWRI on 11 Jan 2017

Invitation to Qatar National Day (6 Dec 2016) at Shangri La Hotel, Dr Mas and Mr Benjamin Moi invitation of HE Ambassador Abdallah Al Hammar.

Contingent from China Energy Conservation and Environmental Protection Group (CECEP) met with Prof Ng on a visit to NEWRI (9th Dec 2016)

Exchange Visit of ASEAN-Korean Media visiting NTU-Hyundai Urban System Centre in NEWRI (21 Nov 2016)

Visit to NEWRI by Nanjing Chemical Industrial Park (21 Nov 2016)
SPOTLIGHT ON

NEWRI is proud to announce and introduce Mr Bill Ho as the Business Development Director of NEWRITech.

A brief introduction to our readers.

Bill Ho is the Business Development Director of NEWRITech, and has been in this role since December 2016. NEWRITech’s mission is to provide effective market solutions in various fields, most specifically environment and water. This is achieved by a careful selection of appropriate technologies developed by NEWRI and associated institutions, and subsequently taking these from laboratory-scale to full-scale deployment and commercialisation. NEWRITech works closely with the ART (Applied Research and Translation) units associated with NEWRI, to provide an effective de-risking of these technologies during their transition to higher Technology Readiness Levels.

Background and specialty?

Prior to joining NEWRI, Mr Ho has had extensive regional experience in the environment and water industries, including 5 years driving key projects in China (Shanghai and Dongguan). He has also been CFO of several Singapore listed companies. Recently, he successfully led the public listing of a local company on the Singapore Stock Exchange in 2014. A certified Chartered Accountant in both Singapore and Australia, Mr. Ho's other achievements have been fund raising, financial and business modelling, mergers & acquisition, and most importantly, his ability to return a loss-making company to profitability. Following his graduation from Deakin University in 1994, he joined KPMG Singapore as a financial auditor, followed by stints in US and Australian multi-national corporations.

Comment on NEWRI and the industry?

I believe NEWRI exist because it acknowledges the widespread environmental degradation and severe stress on the world’s natural resources, such as a global water crisis has been identified as one of the top ten global risks, reflecting not only the increasing incidence of droughts and floods but also the overuse of groundwater resources and worsening pollution; as well as changes in land-use, unsustainable agricultural practices and food systems, that have had negative impacts on food security.

I see NEWRI has already mapped out its operating model, and is in the process of identifying its niches and strengths, and most importantly execution. NEWRITech is to identify the markets for such technologies, thereby narrowing the gap between industry needs and NEWRI’s technology capabilities. Other than commercializing the existing IPs, NEWRITech’s primary objective is to gain a strong foothold in the market by providing applicable solutions with engineering know-how, which is the most direct method to co-develop with industry partners. This partnership does not stop once the IP is established. NEWRITech would continue to monetize further, either within NEWRI and/or its spin-off companies, as well as in continuous flow of R&D activities.

What stands out for you being in NEWRITech?

My contribution is summarised in three key areas:
• Management: this entails internal (within NEWRI) and external factors; Internal factor refers to operational management within NEWRI and NEWRITech to improve its focus on bringing products into the market. External factor refers to managing the expectations from various parties, project/resource coordination, and timely delivery.
• Financial: provide clear insights and better financial control to stakeholders by means of reliable financial and risk analysis, as well as capital structure.
• Business plans: Co-developing business plans with business / industry partners, thereby building a more sustainable business model.

Where do you see NEWRITech in 5 years, and what role will you adopt?

The next few years is to set the pace so that the current team and researchers are able to appreciate the integration of technologies into the market. With right deployment opportunities, I hope to see NEWRITech members grow in both their enthusiasm and management skills, so that they are able to lead a bigger team, perhaps a younger group to build a more sustainable environment.

NEWRI in the NEWS

EDB partners Hyflux in efforts to 'future-proof' business operations

"Hyflux signed a Memorandum of Understanding with Nanyang Technological University’s Nanyang Environment and Water Research Institute (NEWRI) to collaborate on next-generation water-treatment technologies..."

To view the article, please click here

More composting to turn food scraps into fertiliser

"...they are able to lead a bigger team, perhaps a younger group to build a more sustainable environment.

To view the article, please click here

To view the article, please click here
NEWRI hosted 13 of the brightest minds who attended the 5th Global Young Scientists Summit, as they spent time getting to know our organisation and see our laboratories. Presenting NEWRI to these participants were Dr Adil Dhalla and Dr Benjamin Moy. (18 Jan 2017)

SEMIPR ARS, WORKSHOPS & TRAINING

Enhancing staff knowledge and experiences, NEWRI holds regular in-house workshops and seminars by fellow researchers and visiting professors, scientists, institutes, and external visits; allowing knowledge to diffuse throughout the organisation.

Here are some highlights:

Dr Victor Sim conducts the NEWRI Process Design Workshop in NEWRI on 5 Jan 2016.

URECA (Undergraduate Research Experience Campus) of NTU visits NEWRI on 6 Dec 2016, where they got first hand knowledge from our researchers.

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<tr>
<th>Recent Seminars / Conference</th>
<th>Dates</th>
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<td>1. Engineering With Membranes (EWM2017) Recent Advances in Membrane Science and Technology (International Conference)</td>
<td>26 – 28 April 2017</td>
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<td>3. Global Contamination of the environment, another horror story? – Prof Rainer Stegmann</td>
<td>20 February 2017</td>
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<td>4. Sustainable Landfilling: What is the status and what has to be changed? – Prof Rainer Stegmann</td>
<td>13 February 2017</td>
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<td>5. NEWRI Process Design Workshop – Dr Victor Sim</td>
<td>5 January 2017</td>
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Chinese New Year Celebration at NEWRI

We celebrated the Chinese New Year at NEWRI on the 9th February 2017 with much joy and smiles. Everyone was entertained by a roving magician, a caricature artist and performances by NEWRI’s researchers: Marcus Low, Dilhara Sethunga, Ishara Fernando, Chanaka Withana, Supuli Jayaweera, Gayana Herath, Taniya Perera, Sachindra Cooray, and Sulashi Wijesinghe. Prof Ng welcomed all in his address and Prof Wang Rong made special mention of Dr Fang WangXi, Dr Shi Lei, Dr Chou Shuren, and Dr Laurentia Setiawan for their contribution to research. Hongbao vouchers and lucky draw prizes were presented to the lucky participants, followed by the ‘lo-hei’ and lunch. Here’s wishing all gong xi fa cai!

At NEWRI we do not forget our foundation which is deep scientific research. NEWRI’s researchers and professors from our various Centres of Excellence publish frequently in journals, conferences and keynotes. To view the catalog of titles, you can log on to the NEWRI webpage on PUBLICATIONS for more information. Link below:

Please click on NEWRI Publications shortcut: [CLICK HERE](http://newri.ntu.edu.sg/Pages/Home1.aspx)
The most tangible contribution is perhaps the sewage treatment facility installed at the Sri Dalada Maligawa (the Buddha Tooth Relic Temple): “A very challenging job because it is an archeological site... a national treasure... any [harm done to the temple], [report] will go straight to the President”, to quote Mr C.W Karunaratna, Secretary General of the Dalada Maligawa. The facility has simplified connection to the main sewer lines under construction. In the meantime, since its commissioning in 2013, the plant has treated wastewater from the temple complex before discharge to Kandy Lake, eliminating the need for gully bowsers.

The project in Kandy was a collaboration between NEWRI, the University of Peradeniya, the National Water Supply and Drainage Board, Kandy Irrigation Department, and the Kandy Municipal Council.

The project centres on the clean-up of Kandy Lake, which discharges to the Mahaweli River, a main drinking water supply for many parts of Sri Lanka. The project encompassed catchment assessment, design, and deployment of solutions including floating treatment wetlands for Kandy Lake, a sewage treatment plant for the Dalada Maligawa, and an environmental education program for the Mahamaya Girls’ College.

“When the treatment system was proposed, I thought it was high-tech... I have never seen a sequencing batch reactor (SBR) system applied before that... It has worked well and it has now become a model... [NEWRIComm project] has brought technology to the country... and awareness, even at school level,” said Dr C.S Kalpage from the University of Peradeniya.

The authorities and project team members believe our project has helped to push forward the developments by establishing track record and experience among the officials.

The Kandy Municipal Council won the Swarnapura Award (best municipal council) in 2016.

Main silt traps and drainage canal of the city (Mid-Canal) are undergoing rehabilitation when NEWRIComm visited in January 2017.

The city is also constructing sewer lines and a centralized municipal wastewater treatment plant. These are supported by the World Bank and the Japan International Cooperation Agency (JICA).

Local authorities believe the NEWRIComm project has helped to pave the way through research-based recommendations, technology transfer, and capacity building. “Six years ago there was (research done in NEWRIComm project), and ideas came from there,” says Kandy Municipal Council Engineer Mr D.M.D.S Senevirathne.

The Kandy Municipal Council was the Swarnapura Award (best municipal council) in 2016.