1st International Symposium on Innovative Desalination Technologies with INES meeting (Special Programme)

Organised by Global MVP, KAUST
Sponsored by MOLIT, KAIA

Coordinators: Prof. Seung-Hyun Kim and Prof. Gary Amy

Secretaries: Dr. Sarper Sarp and Prof. Sangho Lee

Context and Objectives

Within the increasing impacts of climate change and critical water deficit in many parts of the world, seawater desalination and water reuse are becoming competitive alternative water resources. According to recent market studies, seawater desalination and water reuse will continue to grow rapidly. However, there are potentially constraining issues related to high energy consumption and environmental impact.

In this context, new challenges and needs for research and innovation are emerging and will be covered and discussed during this symposium.

The innovative topics that will be included are as follows:

1) Membrane distillation (MD): research, development, and commercialization
2) Forward osmosis (FO): research, development, and commercialization
3) Pressure retarded osmosis (PRO): research, development, and commercialization
4) Innovative desalination processes and hybrids.

The proposed approach aims to bridge the gaps between fundamental science and practical implementation in order to demonstrate how innovations in seawater desalination can provide a competitive alternative resource to face climate change and water scarcity.

In the INES session, attention is paid to the first experiences with PRO and RED stand alone plants in a natural environment in Europe, as well as the first experiences with connecting RED and desalination.

Venue: COEX 402, Seoul, Republic of Korea
Period: September 1st.~3rd., 2014
Registration: 500 USD (500,000 won)

Workshop Style and Outcomes

The outcomes of this symposium will be the elaboration of a summary document that will be published with a copy of the workshop presentations.

PROGRAMME

Day 1: Membrane Distillation (MD)

9:00 Welcome and Introduction

Session 1 (10.00~12.10) - Membrane Distillation: R&D

Session Chair: Stephen Gray (VU), Seockheon Lee (KIST)

- Membrane distillation research at Victoria University: from models to demonstration (Stephen Gray, VU)
- Novel MD membranes tailored for enhanced flux and lower fouling and wetting propensity (Hassan A. Arafat, MIST)
- Process engineering R&D in MD and scaling-up MD modules processes (Noreddine Ghaffour, KAUST)
- Fouling in membrane distillation (Seockheon Lee, KIST)

Round Table Discussion: 30'

Lunch (12.10-13.40)

Session 2 (13.40~15.50) - Membrane Distillation: Membrane and Application

Session Chair: Neal Chung (NUS), Sangho Lee (Kookmin University)

- Polymeric membranes for membrane distillation (Neal Chung, NUS)
- Hollow fiber membrane and module for MD (Jinho Kim, Econity)
- Membrane distillation using the energy efficient VMEMD process: method, applications and field experiences (Hendrik Muller-Holst, Memsys)
- Applications of Membrane Distillation (Sangho Lee, KMU)

Round Table Discussion: 30'

Coffee Break (15.50~16.20)

Session 3 (16.20~18.30) - Advanced Desalination

Session Chair: TorOve Leiknes (KAUST), In. Kim (GIST)

- Advancing Desalination Technologies for Water Sustainability in Singapore (Jiawei NG, PUB)
- SeaHERO research projects (In. S. Kim, GIST)
- Innovative Li recovery (Jeyong Yoon, Seoul National University)
- Flow Capacitive Deionization (Dongkook Kim, KIER)

Round Table Discussion: 30'

Day 2: Pressure Retarded Osmosis (PRO) and Forward Osmosis (FO)

Session 4 (09.00~12.10) - Pressure Retarded Osmosis: R&D

Session Chair: Masaru Kurihara (Toray), Joon Ha Kim (GIST)

- Mega- Ton Water System including PRO (Masaru Kurihara, Toray)
- Future Desalination and PRO in terms of Methods, Components and Performance Exemplified with Closed Circuit Processes (Avi Efraty, Osmotech)
- Thermodynamic Optimization of SWRO-PRO Process and Effect of Feed Solution Pre-Treatment (Sarper Sarp, Qatar Foundation)

Coffee Break (10.15~10.45)

- System engineering approach for PRO R&D (Joon Ha Kim, GIST)
- The economics of osmotic power production- present and future (Udi Tirosh, IDE)

Round Table Discussion: 30'

Lunch (12.10-13.40)

Session 5 (13.40~15.50) - Pressure Retarded Osmosis: Membranes and Application

Session Chair: Boris Liberman (IDE), Yonggyun Park (GSE&C)

- Polymeric membranes for forward osmosis and osmotic power generation (Neal Chung, NUS)
- Membranes and modules for PRO (Jongwha Lee, Toray Korea)
- Development of a novel SWRO-PRO hybrid desalination system: current status and future prospects (Yonggyun Park, GS E&C)
- Main principles of large-scale PRO plant: Sea-River (Boris Lieberman, IDE)

Round Table Discussion: 30'

Coffee Break (15.50~16.20)

Session 6 (16.20~18.30) - Forward Osmosis

Session Chair: Gary Amy (KAUST), Jinsik Sohn (Kookmin University)

- FO R&D: past, present, and future (Gary Amy, KAUST)
- Evolution of the FO platform for concentrate management (Nathan Hancock, Oasys)
- Innovative FO processes for clean water and power production (Adel Sharif, Qatar Foundation)
- FO-RO project in Korea (S.K. Hong, KU)

Round Table Discussion: 30'

Dinner

Day 3: Symposium Wrap-Up and Synthesis

Session 7 (09:00 – 10:30) - Summary of Round Table Discussions

Session Chair: Seung-Hyun Kim (Kyungnam University), Gary Amy (KAUST)

- 10’ summary of each session (Session chairs)
- Open discussion

Closing Remarks: Seung-Hyun Kim, Symposium co-coordinator

INES MEETING

JOINTLY ORGANISED WITH GMVP, GIST, IMIEU, KIER, INES PARTNERS

'First Experiences with upscaled PRO and RED demonstration projects in Europe and elsewhere'

Workshop organisers: Prof. Joon Ha Kim (GIST), Dr. Chul Park (KIER), Dr. Frank Neumann (IMIEU)

The main purpose of this international meeting is to review the first experiences of commercialisation PRO and RED pilot projects in a natural - out of lab- environment amongst others in The Netherlands and Norway. It is hoped to identify common problems and ways of solving them in the road to industrial up-scaling, and furthermore, to identify what kind of infrastructures are necessary for a larger scale commercialisation.

INES Session I (10:45 ~ 11.50) First experiences with RED Pilot Plant

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Chair: Prof. Joon Ha Kim (GIST)

Welcome word- Prof Joon Ha Kim (GIST), Dr. Moon Suk Jang (KIER—JGRC)

- Introducing the INES project; Overview of running salinity gradient energy demonstration projects –PRO and RED- based upon INES/IMIEU IRENA Study;
  Dr. Frank Neumann (IMIEU)

- Experiences with the first phase of the 50 KW RED pilot project at the Afsluitdijk in The Netherlands; ***Dr. Pieter Hack, (CEO, REDSTACK)***

- Reporting from the REAPOWER project- RED and Desalination; ***Dr. Inge Genee*** **(VITO)**

- Development and application of RED system in Korea; ***Dr. Chan Soo Kim (KIER)***

Discussion on the advancement in RED-development roadmap and its possible application areas

INES Session II (11:50-12:30) First experiences with new initiatives for PRO pilot plants

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- Experiences with PRO up-scaling – combining technical and economic models;
  Dr. Edvard Sivertsen (SINTEF)

- Fouling in PRO and implications for a real plant; **Dr.** ***Willy R. Thelin (SINTEF)***

12:30-13:30 *Lunch*

Session II (13:30 ~ 15:15) PRO Pilot experiences-continued

- The relation between temperature and PRO processes for power generation; ***Dr. Khaled Touati (University of Valladolid-Spain)***
- Membrane Development for PRO systems at KIER jeju; ***Dr. Chul Park, (KIER)***
- Experiences with the development of hollow-fibre membranes at NTU/SMTC; ***Laurentia Setiawan (NTU)/SMTC Membrane Centre)***

Discussion

15:15-15:35 *Coffee Break*

Session III (15:35-16:10) Necessary infrastructures and facilitation of enlargement

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Panel Discussion regarding infrastructure necessary for upscaling RED/PRO

- Panel – *Prof. Joon Ha Kim (GIST), Dr. Pieter Hack (Redstack), Dr. Jiawei Ngo (PUB). Dr. Nam Jo Jejon (KIER), Dr. Frank Neumann (IMIEU), Dr. Willy Thelin (SINTEF) Dr. Boris Liebermann (IDE), Dr. Inge Genee*

Session V (16:10-16:30) Financing possibilities for co-operation

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Discussion on the financing possibilities for the EU, Korea, Asia and international projects

Session V (16:30-17:00) Summarising and Looking ahead

Conclusions from the sessions and looking ahead:
Prof. Seung-Hyun Kim (Kyungnam University), Prof Joon Ha Kim (GIST)
Dr. Frank Neumann (IMIEU),

This INES meeting Hosted by: