

European
Desalination
Society



CYPRUS
11-15 MAY 2014

Conference and Exhibition on
**DESALINATION
FOR THE ENVIRONMENT
CLEAN WATER AND ENERGY**



WSTA DBCWEC

Grand Resort Hotel
Limassol, Cyprus

ABSTRACTS



European
Desalination
Society



AEDyR
ASOCIACIÓN ESPAÑOLA DE
DESALACIÓN y REUTILIZACIÓN



DTSG
Desalination Technology
Specialist Group



WSTA



DBCWEC

CYPRUS

11-15 MAY 2014

Conference and Exhibition on
DESALINATION
FOR THE ENVIRONMENT
CLEAN WATER AND ENERGY

Grand Resort Hotel
Limassol, Cyprus

ABSTRACTS



You can depend on it®

CARAMONDANI
desalination plants



Avista
TECHNOLOGIES



energy recovery™

Danfoss



GENESYS
INTERNATIONAL



Italmatch Chemicals



BWA™
Water Additives



MEKOROT
ISRAEL NATIONAL WATER CO.



Desalination
Directory Online
By Miriam Elalaban



Desalination for the Environment Clean Water and Energy

11–15 May 2014, GrandResort Hotel, Limassol, Cyprus

SCIENTIFIC AND ORGANIZING COMMITTEE

Ursula A. Annunziata
Miriam Balaban
Borja Blanco
Sophie Bertrand
Lute Broens
Marta Farriols Hernando
Maria D. Kennedy
Erineos Koutsakos
Ian Lomax

Giorgio Maria Micale
Olga L. Sallangos
Karen Stummeyer
Nicos Tsiourtis
Johannes S. Vrouwenvelder
Andriy Yaroshchuk
Ahmed Al-Arifi
Ali Redha Hussain

CONFERENCE SCHEDULE

Saturday May 10

Two-day course **Water Treatment for Upstream
Oil and Gas**. Lecturer **John Walsh**

Sunday May 11

Two-day course **Water Treatment for Upstream
Oil and Gas**. Lecturer **John Walsh**

13:00–18:00 Registration for the conference
19:00–21:00 Welcome cocktail

Monday May 12

8:00 Registration
9:00 Opening ceremony
10:00 Exhibition opening
10:45 Keynote presentations
12:45 Lunch
14:00 Technical sessions
18:00 Poster session with refreshments.
Sponsored by Italmatch
Chemicals Spa Technical
19:00 Public Presentation of the Renewable
Energy Desalination Action Group
(European Innovation Partnership on
Water)

Tuesday May 13

All day Technical sessions
20:30 Gala dinner

Wednesday May 14

9:00–15:40 Technical sessions
16:00 Closing
Keynote – Hans-Kurt Flemming
Awards
19:00 IDA Young Leaders' Networking
Event (by invitation)

Thursday May 15

Visit to
MN Limassol Desalination Plant
Kourion Archeological Site
Dhekelia Desalination Plant

Desalination for the Environment Clean Water and Energy

11–15 May 2014, Limassol, Cyprus

CONTENTS

4	How the rapid development of duplex grades influence material selection <i>Timo Piitulainen, Hachemi Loucif (Sweden)</i>	1
6	Forward osmosis softening of seawater to thermal desalination: High temperature FO-MSF/MED hybrid system <i>Ali Altaee, Abdelnaser Mabrouk, Karim Bourouni (UK)</i>	1
9	Experimental study of agitation systems used for THE freeze-thawing process <i>M. Ahmad, A. Al-Odwani, M. Al-Tabtabaei (Kuwait)</i>	2
10	Reducing SWRO life cycle costs by direct coupling of UF and SWRO systems <i>Frans Knops (The Netherlands)</i>	2
11	Corrosion of stainless steel components in seawater reverse osmosis desalination plants – Investigations on adapted internal cathodic protection <i>Nicolas Larché, Philippe Dézerville, Denise Le Flour (France), Pascal Vinzio, Karl-Heinz Köfler (Germany), Dominique Thierry (France)</i>	4
12	Control of severe membrane silica scaling: Investigation and trouble shooting <i>Leila Diouri (Belgium), Wang Lei, Wang Baoxu, Xu Lijun, Ding Xuebing (China), Stephen Choo (Belgium)</i>	5
13	A new assessment of combined geothermal electric generation and desalination in western Saudi Arabia: Targeted hot spot development <i>Thomas M. Missimer, P. Martin Mai, Noredine Ghaffour (Saudi Arabia)</i>	5
14	Situation analyses of energy in Egypt and future prospects <i>Azza Hafez, Maaly Khedr, Kamel-Elkhatib, Hanaa Gaddala, Mervet Badre (Egypt)</i>	6
16	Nanofiltration of oil field produced water for optimum environmental reuse <i>M. Gamal Khedr (Egypt)</i>	7
17	The viability of renewable energy and energy storage to power municipal reverse osmosis desalination facilities <i>Cliff Dansoh (UK)</i>	7
20	Regional hydrodynamic modelling for environmental impact from desalination plants in Qatar <i>Thomaskutty Varghese, Hazim Qiblawey (Qatar)</i>	8
21	Backwashing pressurized ultrafiltration using reverse osmosis brine in seawater desalination and its potential costs savings <i>Guillem Gilabert Oriol, Mufeed Hassan, Javier Dewisme, Kelly Briceño, Veronica Garcia-Molina, Markus Busch (Spain)</i>	9
23	Recovery of solar grade silicon from Kerf loss slurry waste <i>Nadjib Drouiche, Fouad Kerkar, Nabila Boutouchent-Guerfi, Medjahed Sidali, Aissa Kefailia, Malek Ould Hamou, Tarik Ouslimane (Algeria)</i>	10
25	Characterization of the microscopic mechanics in falling film evaporation outside a horizontal tube <i>Luopeng Yang, Zhexuan Xu, Hongxiao Zhang, Shengqiang Shen (China)</i>	10
26	Numerical analysis on thermal performance of a tube bundle in a horizontal-tube falling film evaporator <i>Luopeng Yang, Zhexuan Xu, Hongxiao Zhang, Shengqiang Shen (China)</i>	11
27	CFD modelling of profiled membranes channels for reverse electrodialysis <i>Luigi Gurreri, Michele Ciofalo, Andrea Cipollina, Alessandro Tamburini (Italy), Willem Van Baak (The Netherlands), Giorgio Micale (Italy)</i>	12
28	Technology developments in forward osmosis to address water purification <i>John Webley (USA)</i>	12
29	Capacitive deionisation of water solutions and surface conductivity of porous electrodes <i>Yury M. Volkovich, Daniil A. Bograchev, Alexey A. Mikhailin, Alexey Y. Rychagov (Russia)</i>	13

30	Water treatment in a natural mountain catchment (Wapienica dam reservoir, southern Poland) <i>Andrzej Jagus (Poland)</i>	14
31	SOLMED: solar energy and polymers for seawater desalination <i>Philippe Bandelier, Jean-Jacques d'Hurlaborde, Frédéric Pelascini, Matthieu Martins, Armel Gonda, Dominique Alonso, Maryse Berlandis, Federico Pigni (France)</i>	15
32	Sorption of single enantiomers and racemic mixture of (+/-)-α-pinene into Nafion membranes <i>Libuše Brožová, Jan Žitka, Petr Sysel, Štěpán Hovorka, Alena Randová, Jan Storch, Marie Kačírková, Pavel Izák (Czech Republic)</i>	16
33	Power generation from salinity gradient of saline and hypersaline water using reverse electrodialysis method <i>Amirreza Arashi, Gagik Badalians Gholikandi, Hamed Rasouli (Iran)</i>	17
34	Silica porous membranes synthesis and characterization <i>N. Agoudjil, N. Lamrani (Algeria), A. Larbot (France)</i>	17
35	Improving the taste of tap water thanks to membranes: the case of Barcelona <i>O. Ferrer, J. Raich-Montiu, V. García, M. Paraira, J.L. Cortina, R. Devesa (Spain)</i>	18
36	Adsorption dynamics studies of azo dyes removal by biosorbent <i>Elwira Tomczak, Wladyslaw Kaminski, Pawel Tosik (Poland)</i>	19
37	Kinetics of azo dyes sorption onto low cost sorbents <i>Wladyslaw Kaminski, Elwira Tomczak, Pawel Tosik (Poland)</i>	19
38	Characterization of the inhibitory effectiveness of prominent environmentally friendly anti-scalants <i>Hilla Shemer, David Hasson (Israel)</i>	20
39	Pressure assisted osmosis (PAO)-RO hybrid: impact of hydraulic pressure on fouling and economics <i>G. Blandin (Australia and Belgium), A. Verliefde (Belgium), P. Le-Clech (Australia)</i>	21
41	Reduction of specific energy demand of seawater RO by osmotic dilution/osmotic energy recovery – a realistic modelling approach <i>Marjolein Vanoppen, Sebastiaan Derese, Annelise Bakelants, Arne Verliefde (Belgium)</i>	23
43	Modernization of conventional spiral wound module - principles to design RO without pretreatment and concentrate effluents <i>A.G. Pervov (Russia)</i>	24
45	High permeability FILMTEC™ SEAMAXX™ reverse osmosis elements: A success story in the Canary Islands <i>Blanca Salgado, Juan Manuel Ortega, Jasna Blazheska, Joan Sanz, Verónica García-Molina (Spain)</i>	25
46	One year operational experience with ultrafiltration as pretreatment of seawater reverse osmosis desalination system (Maspalomas-I Plant) <i>Javier Suárez, Blanca Salgado, Antonio Casañas, Juan Carlos González, Jorge Pordomingo (Spain)</i>	26
48	Thin film composite (TFC) polyester nanofiltration membrane: Characterization and its applications in desalination and removal of natural organic matter (NOM) <i>M.N. Abu Seman, N.A. Jalanni, C.K.M. Faizal (Malaysia)</i>	27
49	A flexible techno-economic model for the assessment of desalination plants driven by renewable energies <i>Massimo Moser, Franz Trieb, Tobias Fichter, Jürgen Kern, Denis Hess (Germany)</i>	27
50	Low-temperature organic Rankine cycle engine with isothermal expansion for use in desalination <i>Opubo N. Igobo, Philip A. Davies (UK)</i>	28
51	Multi-variable approach to determine treatment efficiency of wetland: Size effect and electro-kinetic effects <i>Sandeep Gupta, Rattandeep Singh, Prodyut Ranjan Chakraborty, R.K. Sharma (India), A.B.O. Soboyejo, Mark Wahl (USA), Xiaohua Wei (Singapore), Anand Plappally (India)</i>	29
52	Comparative analysis of hydrodynamics of treatment wetlands using finite volume models with empirical data <i>Rattandeep Singh, Sandeep Gupta, S. Raman, Prodyut Chakraborty, Puneet Sharma, Rakesh Kumar Sharma (India), Larry C Brown (USA), Xiaohua Wei (Singapore), Anand Plappally (India)</i>	29
59	Evaluation of the first nine years operating data of an RO brackish water desalination plant in Las Palmas, Canary Islands, Spain <i>A. Ruiz-García, E. Ruiz-Saavedra, S.O. Pérez-Báez, J.E. González-González (Spain)</i>	30

60	A design method of the RO system in reverse osmosis brackish water desalination plants (calculations and simulations) <i>E. Ruiz-Saavedra, A. Ruiz-García, J. Feo-García, A. Ramos-Martín (Spain)</i>	31
61	Design of a small mobile PV Driven RO water desalination plant to be deployed at the north west coast of Egypt <i>Hosam A. Shawky, Amr A. Abdel Fatah, Moustafa M. Said, Abdel Hameed M. El-Aassar (Egypt)</i>	31
62	Economic analysis of a stand-alone reverse osmosis desalination unit powered by photovoltaics for possible application in the north west coast of Egypt <i>Dalia E. Abou-Zied (Egypt)</i>	33
63	Improving antifouling properties of polymeric membranes: a comprehensive investigation <i>Hamed Rasouli, Gagik Badalians Gholikandi (Iran)</i>	35
65	A hybrid process of electrodialysis and solar driven air-gap membrane distillation combined with a photovoltaic cell <i>Kazuo Murase (Japan)</i>	36
66	Thermo-hydraulic prediction with disturbances of an evaporator using second order approach in temporal terms <i>Mariano Colorado-Pineda, F. Alejandro Alaffita, Dario Colorado, Beatris A. Escobedo-Trujillo (Mexico)</i>	36
67	Experiences with a reinforced UF hollow-fiber water filtration system for pretreatment of desalinated water <i>C. Thiemig, H. Yacubowicz, K. Phillips (USA)</i>	37
68	Thermal desalination and air-conditioning using absorption cycle <i>Hassan K. Abdulrahim, Mohamed A. Darwish (Qatar)</i>	38
69	Schemes for salt recovery from seawater and RO brines using chemical precipitation <i>Mohamed H. Sorour, Heba A. Hani, Hayam F. Shaalan, Ghada A. Al-Bazedi (Egypt)</i>	39
70	Liquid-liquid phase equilibria of 2-propanol/water/butanol <i>Nadjet Boulkroune, Sofiane Boulkroune, A. Hassen Meniai (Algeria)</i>	40
71	Natural sunlight photolysis of microcystin-LR in lake and pre-chlorination process <i>Chia-Pei Li, Angela Yu-Chen Lin (Taiwan)</i>	40
72	Optimization of Fenton-electrochemical reactor operation for biological sludge VSS removal using lab-scale setup and mathematical modeling <i>Gagik Badalians Gholikandi, Hamidreza Masihi, Maryam Mirabi, Ali Abrishami (Iran)</i>	41
73	Energy consumption analysis of reverse osmosis desalination plant for production of 4000 m³/d <i>J. Feo-García, A. Ruiz-García, E. Ruiz-Saavedra, N. Melian-Martel (Spain)</i>	42
74	Staff costs analysis in RO desalination plants for production of 600 m³/d <i>J. Feo-García, A. Ruiz-García, E. Ruiz-Saavedra, N. Melian-Martel (Spain)</i>	42
75	Effect of air bubbling for enhancing the efficiency of chemical cleaning in BWRO membrane: A field study <i>Kwang-Tack Ahn, Young-Joo Lee, Kyung-Hyuk Lee, Jae-Lim Lim (Korea)</i>	43
76	Evaluation of pre-treatment performance for BWRO process by multiple membrane array system (MMAS): A field study <i>Young-Joo Lee, Kyung-Hyuk Lee, Jae-Pum Park, Jae-Lim Lim (Korea)</i>	44
77	Molecularly imprinted membrane system for endocrine removal <i>S. Shahaidah, M.S. Shareena, C.K.M. Faizal (Malaysia)</i>	45
78	Submerged membrane distillation for seawater desalination <i>Lijo Francis, Noreddine Ghaffour, Ahmad Al-Saadi, Gary Amy (Saudi Arabia)</i>	45
80	Salinity gradient power generation: A comprehensive study of energy sources <i>Gagik Badalians Gholikandi, Amirreza Arashi (Iran)</i>	46
82	Biofouling reduction using thick spacers in indirect desalination by forward osmosis <i>R. Valladares Linares, Sz. S. Bucs, Z. Li, M. AbuGhdeeb, G. Amy, J.S. Vrouwenvelder (Saudi Arabia)</i>	47
83	Combined solar powered device <i>Arusyak Hakobyan, Arsen Hakobyan, Areg Minassian (Armenia)</i>	48
84	Empirical models for changes in pH and temperature within gravity based reactor columns <i>A. Yadav, G. Kumar, A.B.O. Soboyejo, R.S. Gaur, S.Tiwari, A. Plappally (India)</i>	49

86	Succession of marine biofilm community by the chlorine adaptation <i>Dawoon Jeong, Hyokwan Bae (Korea), Tanja Kleintschek (Germany), Jehoon Lee (Korea), Thomas Schwartz, Ursula Obst (Germany), Seockheon Lee (Korea)</i>	49
87	Study of parameters of the performance of a small MED desalination plant <i>Yali Guo, Lan Wei, Shengqiang Shen, Guiying Chen (China)</i>	50
90	Identification of the fouling caused foulants with different pretreatments during ultrafiltration in polluted raw water <i>Yongwang Liu, Xing Li, Yanling Yang, Jiawei Ren, Siyang Ji (China)</i>	50
92	Dual polyelectrolytes incorporating <i>Moringa oleifera</i> in the dewatering of sewage sludge <i>Thamer Ahmad Mohammad, Ezzuldin Hasan Mohamed, M.J. Megat Mohd Noor, Abdul Halim Ghazali (Malaysia)</i>	51
93	Analysis of salinity and membrane thickness influence on a direct contact membrane distillation module using the dusty gas model <i>I. Hitsov, T. Maere, L. Eykens, K. De Sitter, C. Dotremont, I. Nopens (Belgium)</i>	52
94	Effectiveness of salt extracted freeze-dried <i>Moringa oleifera</i> as a coagulant <i>M.J. Megat Mohd Noor, Ezzuldin Hasan Mohamed, Thamer Ahmad Mohammad, Abdul Halim Ghazali (Malaysia)</i>	54
95	Influence of extraction and freeze drying durations on the effectiveness of <i>Moringa oleifera</i> seeds powder <i>Ezzuldin Hasan Mohamed, Thamer Ahmad Mohammad, M.J. Megat Mohd Noor, Abdul Halim Ghazali (Malaysia)</i>	55
96	The photolysis of 5-fluorouracil in surface water with the presence of bicarbonate <i>Yi-Tsung Lu, Angela Yu-Chen Lin (Taiwan)</i>	56
97	Fouling control in membrane bioreactors by electrokinetic processes <i>L. Borea, V. Naddeo, V. Belgiorio (Italy)</i>	56
98	The IAPWS industrial formulation for the thermodynamic properties of seawater for calculating desalination processes <i>Hans-Joachim Kretzschmar, Sebastian Herrmann, Rainer Feistel, Wolfgang Wagner (Germany)</i>	59
99	Property libraries and software for seawater, steam, water, ice, humid air, and other working fluids for calculating desalination and related processes <i>Hans-Joachim Kretzschmar, Ines Stoecker, Matthias Kunick, Sebastian Herrmann, Mariana Nicke (Germany)</i>	60
101	Alternatives to the use of synthetic organic coagulant-aids in drinking water treatment: improvements in the application of the crude extract of <i>Moringa oleifera</i> seed <i>B. Garcia Fayos, J.M. Arnal, L. Monforte-Monleon, M. Sancho (Spain)</i>	61
102	Study of the relation between kinematic viscosity and SDI in polyethylene glycol solutions for predicting membrane fouling: preliminary test <i>J.M. Arnal, B. García-Fayos, V. Ruiz, M. Sancho (Spain)</i>	62
103	Hydrogel surface modifications for reverse osmosis membranes <i>Christian Langner, Jochen Meier-Haack (Germany), Mona Abdel Rehim (Egypt), Brigitte Voit (Germany)</i>	63
104	Impact of well intake systems on bacterial, algae and organic carbon reduction in SWRO desalination systems, SAWACO, Jeddah, Saudi Arabia <i>Abdullah H.A. Dehwah, Samir Al-Mashhawari, Nizar Kammourie, Thomas M. Missimer (Saudi Arabia)</i>	65
105	Autonomous operation and maintenance of small scale PVRO systems for remote communities <i>Leah Kelley, Huda El Assad, Steven Dubowsky (USA)</i>	66
106	Improving 2nd pass permeate quality using thin film nanocomposite (TFN) membranes <i>M.B. Dixon, D. Kim Hak (USA)</i>	67
107	An improved pre-treatment design for reverse osmosis desalination of Arabian Gulf seawater <i>Kadhem Hassan Madan (Bahrain)</i>	67
108	Experimental evaluation of a multiple effect distillation unit in low seawater flow conditions <i>M.C. Georgiou, A.M. Bonanos, J.G. Georgiadis (Cyprus)</i>	68
111	Adelaide Desalination Plant outfall diffuser performance validation <i>Vanesa Ayala, Tim Kildea, Javier Artal (Australia)</i>	70
112	Old RO membranes: solutions of reuse in a Cradle to Cradle approach <i>Maxime Pontie, Ousseynou Kama (France), Pierre Le Clech (Australia)</i>	70

113 Desalination powered by Corzan® CPVC Technology <i>Wouter Devriese, Stefanie Hahnen (Belgium)</i>	71
118 Production of softened drinking water by a microfiltration technique <i>Mudher Sadiq Saabe, Jasim Mohammed Salman (Iraq)</i>	72
119 Characterization of the salinity of the alluvial aquifer in the upper valley of Wadi Rhumel (eastern Algeria) <i>Abdelhamid Khedidja, Abderrahmane Boudoukha (Algeria)</i>	72
121 Experiences with dynamically driven PV-RO systems and new devices for energy recovery <i>Joachim Went, Julian-Niclas Anhalt, Thomas Kec, Joachim Koschikowski (Germany)</i>	73
123 NaCl cleaning of a ceramic ultrafiltration membrane fouled with protein solutions <i>María-José Corbatón-Báguena, Silvia Álvarez-Blanco, María-Cinta Vincent-Vela (Spain)</i>	74
126 Hydrophilic/hydrophobic composite membranes for membrane distillation <i>L. Eykens, K. De Sitter, C. Dotremont, I. Hitsov, L. Pinoy, B. Van der Bruggen (Belgium)</i>	76
131 Modeling methylene blue oxidation by means of Fenton chemistry enhanced by UV irradiation at mild conditions <i>L. Jiménez-Lima, S. Silva-Martínez, J.A. Hernández, F.Z. Sierra, A. Alvarez-Gallegos (Mexico)</i>	79
132 Lowering desalination costs by alternative desalination and water reuse scenarios <i>V. Yangali Quintanilla, L. Olesen, J. Lorenzen, C. Rasmussen, H. Laursen, E. Vestergaard, K. Keiding (Denmark)</i>	80
135 Sustainable performance of NF-SWRO pilot plant with low fouling NF membranes <i>Mohamed Farooque A., Mohammed Z. Alanazi (Saudi Arabia)</i>	81
136 Nanofiltration membrane cleaning characterization <i>Ahmed Al-Amoudi (Saudi Arabia)</i>	82
137 Corrosion of heat exchanger in thermal desalination plants and current trends in material selection <i>Anees U. Malik, Saleh A. Al-Fozan, Fahd Al-Mualli (Saudi Arabia)</i>	83
138 PCA as tool for intelligent ultrafiltration for reverse osmosis seawater desalination pretreatment <i>T. Maere (Belgium), G. Gilibert Oriol (Spain), W. Naessens (Belgium), V. Garcia-Molina, P. Aerts (Spain), T. Verbrugge (The Netherlands), I. Nopens (Belgium)</i>	86
140 Concentration polarization with equally-accessible membrane surface: why it is essential for modelling and how it can be achieved? <i>Andriy Yaroshchuk, Edxon Licón, Marc Fernandez de la Bastida (Spain)</i>	88
141 Phosphate removal from waste water by a seeding approach using novel seeding material <i>Andreas Kempter, Niklas Loges, Nina Hillesheim, Gerhard Albrecht (Germany)</i>	89
143 Economic assessment for thermal desalination processes <i>Salah Al-Hengari, Walid ElMoudir, Mohamed Ali El-Bousiffi (Libya)</i>	90
145 Monitoring of Flocon 885 in a reverse osmosis plant <i>Suresh Patel (USA)</i>	91
146 Techno-economic assessment of boiler feed water production by membrane distillation with reuse of thermal waste energy from cooling water <i>Norbert Kuipers, Robin van Leerdam, Jolanda van Medevoort, Willy van Tongeren (The Netherlands), Bart Verhasselt, Lieve Verelst, Marnix Vermeersch (Belgium)</i>	92
148 Fouling potential and reclamation feasibility for a closed landfill leachate treated by various pretreatment processes on membrane system <i>Wen-Shing Chang, Shiao-Shing Chen, Tzi-Chin Chang, Hsu-Hui Cheng (Taiwan)</i>	92
149 Application of reverse osmosis pretreatment technologies to a wastewater effluent of a petrochemical industry <i>M.C. Vincent-Vela, S. Álvarez-Blanco, J. Lora-García, C. Carbonell-Alcaina, M. Sáez Muñoz (Spain)</i>	93
150 Thin film composites polyetherimide-polyamide membranes for reverse osmosis <i>H. Kumar, H. Qiblawey (Qatar)</i>	95
151 Biodesalination: the emerging technology for targeted removal of Na⁺ and Cl⁻ from seawater by cyanobacteria <i>J. Amezaga, A. Amtmann, C. Biggs, T. Bond, C. Gandy, A. Honsbein, E. Karunakaran, L.A. Lawton, M. Madsen, K. Minas, M. Templeton (UK)</i>	95

152 Simultaneous production of high quality water and electrical power from aqueous feedstocks and waste heat by high pressure membrane distillation <i>Norbert Kuipers, Jan Henk Hanemaaijer, Hans Brouwer, Jolanda van Medevoort, Albert Jansen, Frank W. Altena, Peter van der Vleuten, Henk Bak (The Netherlands), Dominique Corbisier (Belgium)</i>	96
153 Fouling and cleaning of MD systems under long operational periods <i>Elena Guillen-Burrieza (UAE), Alba Ruiz-Aguirre, Guillermo Zaragoza (Spain), Hassan A. Arafat (UAE)</i>	97
154 Multiple reverse osmosis sub-units supplied by unsteady power sources for seawater desalination <i>George Kosmadakis, Dimitris Manolakos, Erika Ntavou, George Papadakis (Greece)</i>	98
155 Experimental study of air-water up-flow in a column packed with cylindrical pellets using laser doppler anemometry <i>Y.S. Hernández-Demesa, C.A. Varela-Boydo, F.Z. Sierra-Espinosa, L.F. Ramírez-Verduzco, J.L. Cano-Domínguez, J.A. Hernández (Mexico)</i>	99
156 Elimination of bio-refractory chlorinated herbicides like atrazine, alachlor and chlorbromuron from aqueous effluents by Fenton, electro-Fenton and peroxi-coagulation methods <i>C. Lizama Bahena, A. Alvarez, J.A. Hernandez, S. Silva-Martinez (Mexico)</i>	100
157 Heat transfer characteristics of horizontal tube falling film evaporation for desalination <i>Shengqiang Shen, Xue Chen, Xingsen Mu, Yaoyuan Wang, Luyuan Gong (China)</i>	100
158 Flow characterization in spiral wound membrane systems by particle image velocimetry and numerical modeling <i>Sz.S. Bucş, R. Valladares Linares, J.O. Marston, A.I. Radu, J.S. Vrouwenvelder, C. Picoreanu (Saudi Arabia)</i>	101
160 Performance of different hollow fiber membranes for seawater desalination using membrane distillation <i>Lijo Francis, Noreddine Ghaffour, Ahmad Al-Saadi, Gary Amy (Saudi Arabia)</i>	102
161 Batch SWRO-CCD of high recovery, low energy without EDR and wide flux range (10-30 l/mh) for low cost supplies of 10-1,000 m³/d with optional use of solar panels and wind turbines <i>Avi Efraty (Israel)</i>	103
162 Laccase-catalyzed modification of PES membranes using amine-bearing modifiers <i>N. Nady, A.H. El-Shazly (Egypt)</i>	104
163 Optimizing decolorization of methylene blue dye by electrocoagulation using Taguchi approach <i>M. Tir, N. Moulai-Mostefa, M. Nedjhioui (Algeria)</i>	105
164 Numerical simulation on flat sheet direct contact membrane distillation for seawater desalination: Effect of shapes and configurations of spacer filament <i>Jangwon Seo, Youngmi Kim, Joon Ha Kim (Korea)</i>	106
165 Prediction of global solar radiation by artificial neural network based on a meteorological environmental data <i>J. Díaz-Gómez, A. Parrales, A. Álvarez, S. Silva-Martínez, D. Colorado, J. A. Hernández (Mexico)</i>	106
166 Treatment efficiency of wetlands using three dimensional photography <i>Shanmuganathan Raman, Rattandeep Singh, Sandeep Gupta, Puneet Sharma, Rakesh Sharma, Anand Plappally (India)</i>	107
168 Wind powered RO desalination <i>T. Bilstad, E. Protasova, A. Simonova, S. Stornes, I. Yuneizi (Norway)</i>	108
169 Experimental comparison of the performance of two reverse osmosis desalination units equipped with energy recovery device <i>Evangelos Dimitriou, Essam Sh. Mohamed, G. Papadakis (Greece)</i>	109
171 Local material composite sintered systems for fluoride removal <i>Ganpat Choudhary, Rakesh K Sharma, Anand Plappally (India)</i>	110
172 Small-angle neutron scattering studies on the effect of organic matter on RO membrane scaling in wastewater desalination <i>Dietmar Schwahn (Germany), Yara Dahdal (Israel), Vitaliy Pipich (Germany), Roni Kasher, Yoram Oren (Israel)</i>	110
174 Desalination and concentration of liquid dyes by nanofiltration <i>P. Mikulášek, J. Cuhorka (Czech Republic)</i>	111

175 Recovery of chromium from full-scale plastic plating wastewater by cetyltrimethylammonium bromide MEUF and electro dialysis <i>Wen-Shing Chang, Shiao-Shing Chen, Cheng-Hang Sie, Hsu-Hui Cheng (Taiwan)</i>	112
176 Effects of co-existing anions and chelating agent on the retention characteristics of chromate by MEUF <i>Wen-Shing Chang, Shiao-Shing Chen, Jhong-Wei Yu, Hsu-Hui Cheng (Taiwan)</i>	113
177 Parametric performance test of distiller utilizing solar and waste heat <i>Chang-Dae Park, Byung-Ju Lim, Y.D. Noh, S.S. Lee, Kyung-Yul Chung (Korea)</i>	114
178 Ibuprofen removal by hybrid activated carbon adsorption and ceramic membrane filtration <i>Shengji Xia, Yukun Wan, Yumin Zhou, Jianwei Chen, Ruiling Yang, Xinghuan Zhang (China)</i>	114
179 Organic fouling of forward osmosis membrane by selected organic fractions <i>Shengji Xia, Lijuan Yao, Yumin Zhou, Jianwei Chen, Ruiling Yang, Xinghuan Zhang (China)</i>	115
180 Organic matter removal by forward osmosis membranes <i>Shengji Xia, Xinhuan Zhang, Yumin Zhou, Jianwei Chen, Ruiling Yang, Xinghuan Zhang (China)</i>	116
181 New insights into organic fouling of reverse osmosis and ultrafiltration membranes <i>Anastasios J. Karabelas (Greece)</i>	117
182 Productivity analysis of two spiral-wound membrane distillation prototypes coupled with solar energy <i>G. Zaragoza, A. Ruiz-Aguirre, D.C. Alarcón-Padilla (Spain)</i>	117
184 Improvement of reverse osmosis performance of polyamide thin film composite membranes using TiO₂ nanoparticles <i>Abdel-Hameed Mostafa A. El-Aassar (Egypt)</i>	118
185 Treatment of oily wastewater by combining ozonation and microfiltration <i>Zsolt László Kiss, Lajos Kocsis, Gábor Keszthelyi-Szabó, Cecília Hodúr, Zsuzsanna László (Hungary)</i>	118
187 Cost effective, nanofiltration-based method for enriching desalinated water with Mg²⁺, Ca²⁺ and SO₄²⁻ <i>Birnhack Liat, Telzhensky Marina, Lahav Ori (Israel)</i>	119
188 Particles transport through polymeric reverse osmosis membranes using molecular dynamics simulations <i>Youngmi Kim, Joon Ha Kim (Korea)</i>	120
189 Optimization of chemical cleaning of a RO membrane from a desalination plant by means of two-step static tests <i>B. Garcia-Fayos, J.M. Arnal, A. Gimenez, S. Alvarez-Blanco, M. Sancho (Spain)</i>	121
190 Static cleaning tests as the first step to optimize RO membranes cleaning procedure <i>B. Garcia-Fayos, J.M. Arnal, A. Gimenez, S. Alvarez-Blanco, M. Sancho (Spain)</i>	122
191 Assessing the validity of solar membrane distillation for disinfection of contaminated water <i>A. Ruiz-Aguirre, G. Zaragoza (Spain)</i>	123
192 A new solution for control of biofouling in RO membranes <i>Mehrdad Hesampour, Jaakko Ekman (Finland)</i>	124
193 Spacer or membrane based biofouling in RO systems <i>Nadine Siebrath, Wei Ding, Wolfgang Uhl (Germany)</i>	124
194 Crevice corrosion performance of high alloy stainless steels and Ni-based alloy in desalination industry <i>N. Larché, P. Boillot, P. Dézerville, E. Johansson, J. M. Lardon and D. Thierry (France)</i>	126
196 The Canary Islands and its passion for water desalination <i>J. Jaime Sadhwani Alonso, Noemi Melián-Martel, Luis Álvarez Álvarez, Jaime Sadhwani Díaz (Spain)</i>	126
198 Photocatalysis of a cationic azo dye in a photoreactor equipped with an emulsion-Venturi <i>M. Berkani, M. Bouhelassa, M.K. Bouchareb (Algeria)</i>	127
199 Decolorization efficiency of C.I. basic blue 41 by UV/TiO₂ photo-catalytic process in semi-pilot scale prototype solar photoreactor <i>M.K. Bouchareb, M. Bouhelassa (Algeria)</i>	128
200 An investigation into the effect on the productivity of cascade type solar distillation systems with varying cover thicknesses and still orientations under tropical Caribbean climatic conditions <i>Monica K. Boodhan, Indra Haraksingh (Trinidad, West Indies)</i>	128

201 Pilot-scale assessment of colloidal fouling in spiral wound reverse osmosis membranes for seawater desalination <i>N. Melián-Martel, J. Jaime Sadhwani Alonso, J.M. Veza (Spain)</i>	129
203 Critical performance evaluation of dead-end ultrafiltration pretreatment in a seawater reverse osmosis desalination plant in the Arabian Gulf <i>Kadhem Hassan Madan (Bahrain)</i>	129
204 Catalase immobilized in membrane capsules in removing microorganisms from water and beverages <i>Anna Trusek-Holownia, Andrzej Noworyta (Poland)</i>	130
205 Technical and socioeconomic justification for photovoltaic powered electro dialysis desalination for rural Indian villages <i>Natasha Wright, Amos G. Winter, V. (USA)</i>	131
206 Operational experience from hybrid RO system at SAFI wastewater re-use RO plant <i>Craig Bartels, Roman Boda, Ahmed Abrar (USA)</i>	131
208 PVDF-HFP electrospun membranes for desalination by membrane distillation <i>Boor Singh Lalia, Elena Guillen, Hassan A. Arafat, Raed Hashaikheh (UAE)</i>	132
209 The process performance and fate of boron in a multi-stage forward osmosis process for integrated water management <i>Zhenyu Li, Rodrigo Valladares Linares, Muhannad Abu-Ghdaib, Gary Amy (Saudi Arabia)</i>	133
210 Optimization of the arrangement of spiral wound RO modules in a pressure vessel based on desired water quantity and quality <i>Kwanho Jeong, Yeyoung Shim, Jihye Kim, Joon Ha Kim (Korea)</i>	135
211 Membrane distillation for treatment of highly concentrated wastewaters in unconventional oil and gas applications <i>Hendrik Müller-Holst, Markus Wenzel, Stephan Heinzl, Wolfgang Heinzl (Germany)</i>	135
212 Treatment of landfill leachate by membrane processes of nanofiltration and reverse osmosis <i>Krešimir Košutić, Davor Dolar, Tea Strmecky (Croatia)</i>	136
213 Scarcity versus abundance <i>Mohammed AbdulKareem Al-Sofi (Saudi Arabia)</i>	137
217 Experimental analysis of solar thermal driven water purification using membrane distillation along with domestic hot water production <i>Uday Kumar N T (UAE), Andrew Martin (Sweden)</i>	139
219 Performance evaluation of different membrane distillation configurations <i>Ahmad. S. Alsaadi, Lijo Francis, Gary Amy, Noredine Ghaffour (Saudi Arabia)</i>	140
220 Measuring and modeling pH evolution in reverse osmosis processes <i>Oded Nir, Ori Lahav (Israel)</i>	141
222 High performance polymer based heat exchanger tubes <i>Thomas Orth, Patrick Mueller, Carola Vollmer, Heike Glade, Alexander Stärk (Germany)</i>	142
223 Trends in research and development activity in desalination at Mekorot and its contributions to design improvements <i>Inbal David, Menahem Priel, Pinhas Glueckstern, Arina Shulman, Elena Gelman, Sarit Bason, Eyal Sahar (Israel)</i>	143
224 The use of phosphorus-free antiscalants in BWRO desalination plants and brine disposal pipelines <i>S. Bason, I. David, A. Shulman, M. Priel (Israel)</i>	144
227 Granular activated carbon filtration as a pretreatment to ultrafiltration for seawater desalination <i>Mathias Monnot, Stéphanie Laborie, Corinne Cabassud (France)</i>	144
229 Palmachim Seawater desalination plant – process improvements incorporated in the expanded plant <i>Iris Sutzkover-Gutman, Avner Hermoni, Yonatan Talmi, Ofer Fine (Israel)</i>	145
231 Experimental study on osmotic backwash cleaning of organic fouling in a reverse osmosis system <i>Yeyoung Shim, Kwanho Jeong, Yong-shin So, Mijin Kim, Joon Ha Kim (Korea)</i>	146
233 Early non-destructive biofouling detection and spatial distribution: application of oxygen sensing optodes <i>N. Farhat, A. Siddiqui, M. Staal, J.S. Vrouwenvelder (Saudi Arabia)</i>	146

234 Simulation of the fouling trend of ultrafiltration membranes treating a secondary effluent from a municipal wastewater treatment plant <i>M. Torà-Grau, J.L. Soler-Cabezas, M.C. Vincent-Vela, J.A. Mendoza-Roca, F.J. Martínez-Francisco (Spain)</i>	148
235 Wetting behaviour of different tube materials and its influence on scale formation in multiple-effect distillers <i>Alexander Stärk, Heike Glade, Katell Loisel, Karine Odiot, Achim Feßenbecker, Andreas Kempter, Stephan Nied (Germany)</i>	150
238 Feasibility of using a subsurface intake for SWRO facility, south of Jeddah, Saudi Arabia <i>Samir Al-Mashharawi, Abdullah H. A. Dehwah, Khaled Bin Bandar, Thomas M. Missimer (Saudi Arabia)</i>	151
239 Analysis of the time step influence in the yearly simulation of dual-purpose solar thermal concentrating plants <i>Bartolomé Ortega-Delgado, Diego C. Alarcón-Padilla, Lourdes García-Rodríguez, Guillermo Zaragoza, Julián Blanco (Spain)</i>	152
241 Efficient fitting of nanofiltration model parameters for a specified groundwater type by selecting suitable characterization data sets <i>Irene Fernández-Fernández, José M. Gozávez-Zafrilla, Asunción Santafé-Moros (Spain)</i>	153
242 Experimental simulation of continuous nanofiltration processes using a pilot-plant in batch mode <i>Asunción Santafé-Moros, José M. Gozávez-Zafrilla (Spain)</i>	154
244 Lahat BWRO plant - Technical and economical evaluation of energy recovery alternatives <i>Menahem Priel, Eyal Orly, Moshe Adler, Anat Lakretz (Israel)</i>	154
245 Santa Barbara, Curacao desalination plant expansion using NanoH₂O thin film nanocomposite (TFN) SWRO membrane <i>David Kim Hak, Mike B. Dixon, Manuel A. Galan (USA), Frank Boisseau (France), Joseba Gallastegui (Spain), Ralph Martina (Netherlands Antilles)</i>	155
249 Desalination using membrane distillation: Module design and performance analysis <i>David Düver, Joachim Koschikowski, Daniel Winter (Germany)</i>	156
250 Heating seawater: the solution or the pipe dream of reverse osmosis electrical consumption <i>Sébastien Delagarde, Sophie Bertrand (France)</i>	157
252 Co-precipitations of scale on multiple effect evaporators (MED) at non-conventional temperature <i>Houda Hchaichi, Ahmed Hannachi (Tunisia)</i>	158
253 Transformation of X-ray contrast media in reverse osmosis brines by advanced oxidation processes <i>Sara Azerrad, Maayan Gilboa, Carlos G. Dosoretz (Israel)</i>	158
254 Technical feasibility of a seabed gallery seawater intake at Ras Abu Ali Island, Saudi Arabia <i>Rinaldi M. Rachman, Thomas M. Missimer (Saudi Arabia)</i>	160
255 Nano-coated surfaces to mitigate fouling in thermal water services <i>A. Al-Janabi, M.R. Malayeri (Germany)</i>	161
256 Performance of ion separation in electrodialysis exchange membranes <i>K. Mohammadi, M.R. Malayeri (Germany)</i>	162
258 Abatement of deposit formation in aqueous systems using various projectiles <i>M.R. Malayeri, M.R. Jalalirad (Germany)</i>	162
259 Pharmaceutical wastewater treatment in an activated sludge reactor <i>F.K. Kies, M. Senouci-Bereksi, F. Bentahar (Algeria)</i>	163
261 Cavitation reactor for advanced treatment of contaminated water: The effect of recovery pressure <i>M. Capocelli, M. Prisciandaro, A. Lancia, D. Musmarra (Italy)</i>	164
262 Ultrafiltration membrane cleaning performance using super-saturated CO₂ solution <i>Mohammed Al-Ghamdi, Kalthom Kalantan, Abdulsalam Alhadidi, Gary Amy, Noredine Ghaffour (Saudi Arabia)</i>	165
263 Odourless dechlorination for reverse osmosis <i>Mike Jefferies, Dan Freeman, Dan Comstock (UK)</i>	166
265 Improving the environmental aspects of RO chemicals <i>Mike Jefferies, Fiona Finlayson (UK)</i>	166

266 Techniques for UF and MF autopsies <i>Mike Jefferies, Fiona Finlayson (UK)</i>	167
267 Design of power systems for reverse osmosis desalination in remote communities <i>Amy M. Bilton, Leah C. Kelley (USA)</i>	167
268 Desalination using membrane distillation: influence of scale formation on process performance and module lifetime <i>D. Duever, K. Lehmann, F. Saravia, D. Winter, J. Koschikowski, H. Horn (Germany)</i>	168
270 Removal of organic pollutant from aqueous media by adsorption using <i>Ziziphus jojoba</i> seeds activated carbon. Kinetic and equilibrium studies <i>Oumessaâd Benturki, Asma Benturki (Algeria)</i>	169
271 Effect of some physical and chemical properties on the interactions between biopolymers and anionic surfactants <i>Mohammed Nedjhioui, Nadji Moulai-Mostefa, Mohamed Tir (Algeria)</i>	170
272 Study of BSA fouling by FTIR-ATR and flux recovery as a tool to evaluate cleaning efficiency <i>M.J. Luján Facundo, J.A. Mendoza Roca, B. Cuartas Uribe, S. Álvarez Blanco (Spain)</i>	170
273 MED parallel system powered by concentrating solar power (CSP). Model and case study: Trapani, Sicily <i>Sérgio Casimiro, João Cardoso, Christos Ioakimidis, J. Farinha Mendes, Carmelo Mineo (Portugal), Andrea Cipollina (Italy)</i>	171
274 Softening of seawater and desalination brines using grafted polysaccharide hydrogels <i>Mohamed H. Sorour, Heba A. Hani, Hayam F. Shaalan, Marwa M. El Sayed, Mayyada M.H. El-Sayed (Egypt)</i>	172
275 Application of disc filter to pre-treatment system of SWRO <i>Hyung-Ho Jung, Dong-Hoon Lim (Korea)</i>	172
276 Investigation of scale formation on SWRO brine treatment by vacuum membrane distillation system <i>Eunkyung Jang, Sook-Hyun Nam, Yong-Jun Choi (Korea), Gayathri Naidu, Saravanamuthu Vigneswaran (Australia), Tae-Mun Hwang (Korea)</i>	174
277 Effect of operating parameters on temperature and concentration polarization in vacuum membrane distillation process <i>Eun-kyung Jang, Yong-jun Choi, Tae-Mun Hwang, Eun-ju Kim (Korea)</i>	175
278 A high efficient SWRO skid providing the lowest energy consumption and highest uptime <i>Palle Olsen (Denmark)</i>	175
280 A novel hybrid seawater desalination system using gas hydrate and reverse osmosis processes <i>Suhan Kim, Jun-Heok Lim (Korea)</i>	176
284 Experiments on the effects of back washing processes on UF membrane cleaning <i>Dae Hoon Song, Sang-Jin Park, Hyung-Ho Jung (Korea)</i>	176
285 Assessment of the use of solar thermal collectors for desalination <i>Pedro Horta (Portugal), Guillermo Zaragoza, Diego Alarcón-Padilla (Spain)</i>	178
286 The impact of feed spacer orientation on particle deposition in spiral-wound membrane systems <i>A.I. Radu, M. van Steen, J.S. Vrouwenvelder, M.C.M. van Loosdrecht, C. Picioreanu (The Netherlands)</i>	179
287 Desalination – A tide eye to mix tremendous world culture in forecasting future <i>Shigeki Toyama, Kazuo Murase, Masayoshi Hirai (Japan)</i>	180
288 Experimental investigation of a multi-skid reverse osmosis (RO) unit operating at a wide load range powered by a small-scale organic rankine cycle (ORC) engine <i>Erika Ntavou, George Kosmadakis, Dimitris Manolakis, George Papadakis (Greece)</i>	180
289 Numerical study of flow, temperature and salinity distributions of a brine discharge problem <i>Sami AlSanea, Jamel Orfi, Abdullah Najib (Saudi Arabia)</i>	181
290 Isothiazolones for long-term preservation of RO membranes – experience at the Camp de Tarragona plant <i>Joan Sanz, Blanca Salgado, Elisenda Taberna, Markus Busch, Jordi Mas, Richard Levy, Núria Vigués, Jordi Molist (Spain)</i>	182
291 Geothermal desalination in Saudi Arabia <i>J. Orfi, M. Alharbi, Z. Al Suhaibani (Saudi Arabia)</i>	182

293 Investigating the effects of elevated salinity from seawater reverse osmosis desalination concentrate on mushroom corals (<i>Fungia</i> sp.) from the Red Sea <i>R. van der Merwe, C. Voolstra, T. Rothig, M. Ochsenkühn, S. Lattemann, G. Amy (Saudi Arabia)</i>	183
294 Performance analysis of a gas turbine unit combined with MED-TVC and RO systems <i>Abdulaziz Alzahrani, Jamel Orfi, Zeyad Alsuhaibani (Saudi Arabia)</i>	184
295 Innovative configuration for SWRO units with center port pressure vessel <i>Caroline Barbé, Pierre Jean Remize, Jérôme Leparç, Catherine Daines, Claire Ventresque (France)</i>	184
297 Algal toxin removal in desalination processes <i>Siobhán Boerlage, Nadil Nada (Australia)</i>	187
299 Impact of hydrodynamic shear on membrane fouling indices <i>Rinnert Schurer, Geethanjali Gunatilake, Sergio G. Salinas Rodriguez, Jan C. Schippers, Maria D. Kennedy (The Netherlands)</i>	188
301 Reverse electro dialysis process: Analysis of optimal conditions for process scale-up <i>Michele Tedesco, Paolo Mazzola, Alessandro Tamburini, Giorgio Micale (Italy), I. David L. Bogle (UK), Michael Papapetrou (Germany), Andrea Cipollina (Italy)</i>	189
302 Insights into desalination plant operation through advanced modeling and simulation of spiral wound membrane element performance <i>A. J. Karabelas, C. P. Koutsou, M. Kostoglou (Greece)</i>	189
303 Preliminary techno-economics assessment of developed desalination/salt recovery facility based on membrane and thermal techniques <i>Mohamed H. Sorour, Heba A. Hani, Hayam F. Shaalan, Ghada A. Al-Bazedi (Egypt)</i>	190
304 Investigation of module vibration on ultrafiltration <i>Szabolcs Kertész, Ádám Veszprémi, Zsuzsanna László, József Csanádi, Gábor Keszthelyi-Szabó, Cecilia Hodúr (Hungary)</i>	191
305 Removal of fluorides from industrial wastewater by precipitation and reverse osmosis processes <i>Abdessalem Ezzeddine, Nouha Meftah, Ahmed Hannachi (Tunisia)</i>	192
306 Investigation on the use of reverse osmosis brackish water desalination brine in wet process phosphoric acid <i>Khaoula Minyaouia, Fatma Ben Rejeb, Ahmed Hannachi (Tunisia)</i>	192
307 An innovative approach to the design of permeable adsorptive barriers (PAB) for pollutant removal from groundwater <i>I. Bortone, A. Di Nardo, M. Di Natale, A. Erto, D. Musmarra, G. Santonastaso (Italy)</i>	193
308 Larnaca SWRO upgrade <i>Beat Schneider (USA)</i>	193
310 Las Palmas ERD experience <i>Juan Marcos, Jose Morgade (USA)</i>	194
312 Drought and desalination: Melbourne water supply choices in the 21st century <i>Michael G. Porter, David Downie, Helen Scarborough, Oz Sahin, Rodney A. Stewart (Australia)</i>	194
313 Environmentally friendly antiscalant effective in inhibition of scale formation and dispersing organic and colloidal matter in seawater desalination plants <i>Irene Marian, Nùria Adroer, Eduard Cortada, Daniela Vidal, Jordi Aumatell (Spain)</i>	196
317 Fluctuations in potable water quality in Cyprus during the past 2 decades – the role of seawater desalination <i>Aristos Loucaides, Erineos Koutsakos (Cyprus)</i>	197
318 Renovation of the Larnaca Desalination Plant, Cyprus <i>Erineos Koutsakos (Cyprus)</i>	198
319 Design, build, commission and stand by mode of operation of the Limassol Desalination Plant, Cyprus <i>Erineos Koutsakos (Cyprus)</i>	198
320 As part of major renovation work, implementation of constant pressure desalination method in Larnaca SWRO Desalination Plant, Cyprus <i>Eli Kotzer, Hadas Keren, Dahlia Goldberg (Israel), Erineos Koutsakos (Cyprus), Eduard Gasia, Veronica Garcia Molina (Spain)</i>	199
321 More water at lower costs: innovative solutions for up-rating the existing desalination plants <i>Clemens Wolters, Mohsen Moussaoui, Jürgen Riedel, Aldo Massarani, Jayson Cleaver (UAE)</i>	200

322 Palmachim Seawater desalination plant –7 years of expansions with uninterrupted operation <i>Avner Hermony, Iris Sutzkover-Gutman, Ofer Fine, Yonatan Talmi (Israel)</i>	201
323 Ashkelon Desalination Plant – Operation and maintenance feedback after 8 years of operation <i>Shai Dreizin (Israel)</i>	201
324 Energy recovery using salinity gradients at different temperatures in multi-effect distillation systems <i>Khaled Touati, Lidia Roca, Fernando Tadeo, Luis J. Yebra, Thomas Schiestel (Spain)</i>	202
325 Impact of algal blooms on seawater reverse osmosis desalination <i>Loreen Villacorte, Gary Amy, Jan C. Schippers, Maria D. Kennedy (The Netherlands)</i>	202
326 The use of flotation and ceramic membranes for surface water treatment and pre-treatment in desalination <i>Matan Beery, Johanna Ludwig, Lucas León, Alexander Hög (Germany)</i>	203
327 Performance of an innovative step-feed An-M(A/O)-MBR process for nutrients removal <i>L.M. Yuan, C.Y. Zhang, J.Y. Xu, J.S. Chu, Q. W. Wu, L.Y. Zhou, J.T. Liu (China)</i>	204
328 Microbubble RO membrane cleaning reduces fouling on salad washing RO plant <i>Stephen P. Chesters, Matthew W. Armstrong, Maqsood Fazel (UK)</i>	204
329 Up-scaling of electrolysis for effective suppression of cyanobacteria from freshwaters <i>Gurminder Sardool (Malaysia), Yoshiteru Hamatani (Japan), Masafumi Goto, Megat Johari Megat Mohd Noor (Malaysia), Motoo Utsumi, Norio Sugiura (Japan), Zaini Ujang (Malaysia)</i>	205
331 Treating oil field co-produced water for LowSal water injection and EOR purposes using forward osmosis application <i>Mohammed Al Aufi (UK), Adel. O Sharif (Qatar), R.B. Thorpe (UK)</i>	206
332 Successful operation of extending the life span of reverse osmosis membranes at RO desalination plant, Ras Abu Jarjur, Kingdom of Bahrain <i>M.J. Al Hammer, F.A. Al Haddad, Chellian Pal Pandian (Bahrain)</i>	206
333 RO membrane cleaning using microbubbles at 6,800 m³/d wastewater RO Plant in UAE <i>Maqsood Fazel, S. Chesters (UK)</i>	207
335 Suitability of cationic flocculants for RO membranes performance improvement <i>N. Peña, F. del Vigo, O. Salmerón, J. Rodríguez, A. Borrell (Spain), S.P. Chesters (UK)</i>	208
337 Economic and environmental analysis of brackish water desalination using a hybrid wind-PV-diesel stand-alone system in Adrar Region (Southern Algeria) <i>Zakaria Triki, Mohamed Nadjib Bouaziz, Rachid Djeflal (Algeria)</i>	208
338 Qatar and GCC water security <i>Mohamed Ali Darwish, Hassan K. Abdulrahim, Yasir Mohieldeen (Qatar)</i>	209
339 The nano-enhanced thin-film composite membrane for seawater desalination and energy harvesting <i>Moon Son, Hyeongyu Choi, Lei Liu, Hosik Park, Heechul Choi (Korea)</i>	209
342 How many NDPs exist in RO? <i>Amitzur Barak (Israel)</i>	210
343 Measurements of temperature polarization phenomena in membrane distillation channels by a thermographic technique <i>A. Tamburini, A. Cipollina (Italy), S. Al-Sharif, M. Al-Beirrutty (Saudi Arabia), L. Gurreri, G. Micale, M. Ciofalo (Italy)</i>	211
344 Magnesium recovery from concentrated brines <i>A. Cipollina, M. Bevacqua, P. Dolcimascolo, A. Brucato (Italy), H. Glade, L. Buether (Germany), G. Micale (Italy)</i>	212
345 Role of UF pretreatment in controlling the biological growth potential in SWRO <i>Nirajan Dhakal, Aliya M.I. Nazeer, Yuli Ekowati, Rinnert Schurer, Loreen Villacorte, Sergio G. Salinas Rodriguez, Emmanuelle Prest, Hans Vrouwenvelder, Jan C. Schippers, Maria D. Kennedy (The Netherlands)</i>	212
346 Synthesis of nanocomposite membranes and their application in photocatalytic process for organic pollutions removal from groundwater, East Nile Delta, Egypt <i>Moustafa M. Abo El-Fadl, Abdel Hameed M. El-Aassar, Amr A. Mohamed (Egypt)</i>	213
347 Past and current status of membrane distillation towards the future <i>Mohamed Khayet (Spain)</i>	214

348 Fouling control of MD for seawater and RO brine desalination <i>Nguyen Quynh Mai, Hong-Seok Kim, Seongpil Jeong, Seockheon Lee (Korea)</i>	215
349 Optimization of MD process for seawater desalination and brine treatment <i>Jaewuk Koo, Sangho Lee, June-Seok Choi (Korea)</i>	215
350 Osmotic power generation by pressure retarded osmosis: Water resource, technology, and the renewable energy <i>Yu Chang Kim, Sang-Jin Park (Korea)</i>	216
351 Evaluation and implementation of SWRO-PRO hybrid process for less energy intensive desalination <i>Sarper Sarp, InHo Yeo, Sanghyun Kim, Jihyeon Oh, Kyungmi Cheon, Youngyun Park (Korea)</i>	216
352 Thin film composite pressure retarded osmosis membrane for high power density <i>Sungyun Lee, Yeonju Shim, Jong Hwa Lee, Geungsik Jeong, Hyoseok Kim, HeeSeok Im (Korea)</i>	217
353 Lithium recovery from aqueous solution using a new electrochemical system <i>Seoni Kim, Jaehan Lee, Jinsoo Kang, Kyusik Jo, Yung-eun Sung, Jeyong Yoon (Korea)</i>	217
354 CFD modelling of profiled membranes channels for reverse electrodialysis <i>Luigi Gurreri, Michele Ciofalo, Andrea Cipollina, Alessandro Tamburini (Italy), Willem Van Baak (The Netherlands), Giorgio Micale (Italy)</i>	218
355 Alginate fouling resistance of functionalized carbon nanotube blended nano-enhanced membrane for forward osmosis <i>Hyeon-gyu Choi, Moon Son, Hosik Park, Heechul Choi (Korea)</i>	219
356 Effect of membrane type and material on energy production and desalination in forward osmosis based bioelectrochemical system <i>Euntae Yang, Kyoung-Yeol Kim, Mi-Young Lee, In S. Kim (Korea)</i>	220
357 Adaptation of ceramic membrane process for building management water supply system <i>Changkyu Lee, Kwang Duk Park, Youngmin Kim, June-Seok Choi, Jaero Park (Korea)</i>	221
358 Optimum design of MD and RO combined system for reducing concentrate in SWRO process using renewable energy <i>Changkyu Lee, Kwang Duk Park, Youngmin Kim, June-Seok Choi, Hyunje Oh, Sangho Lee (Korea)</i>	222
359 Fabrication of a few-layered graphene and graphene oxide membrane for water purification <i>Chang-Min Kim, Ki-Bum Park, Sung-Jo Kim, Seungho Kook, In S. Kim (Korea)</i>	223
360 Microalgae to remove nutrients in sewage effluent as a dilution water source of seawater to SWRO desalination system — The effect of nutrient starvation <i>Rawiwan Boonchai, Gyutae Seo (Korea)</i>	224
362 Application of nisin to reduce biofilm on reverse osmosis (RO) membrane formed by <i>Pseudomonas aeruginosa</i> P60 and <i>Bacillus</i> sp. <i>Yong-moon Jung, Lan Hee Kim, In S. Kim (Korea)</i>	225
364 Reverse osmosis associated to hydrostatic pressure plants for seawater desalination <i>C. Charcosset (France)</i>	226
365 Fluoride removal from water by calcite and acid addition followed by microfiltration <i>A. Ben Nasr, K. Walha (Tunisia), F. Puel, D. Mangin (France), R. Ben Amar (Tunisia), C. Charcosset (France)</i>	227
366 Innovative ceramic hollow fiber membranes for recycle/reuse of oil-field produced water <i>M. Ebrahimi, S. Kerker, S. Daume, S. Schütz, F. Ehlen, P. Czermak (Germany)</i>	229
367 Preliminary results of the experimental evaluation of a vacuum multi-effect membrane distillation system <i>J.A. Andrés-Mañas, A. Ruiz-Aguirre, F.G. Ación, G. Zaragoza (Spain)</i>	230
368 Financial analysis of NF membranes for upgrading municipal wastewater treatment <i>Hayam F. Shaalan, Mahmoud El Tokhy, Abbas M. Sharaky, Nabil M. Abd El-Monem, Ghada A. Al Bazed (Egypt)</i>	231
369 Application of a ceramic membrane for the treatment of MTBE-contaminated water by O₃/H₂O₂ combination <i>S. Stylianou, A. Zouboulis, Z. Mantha (Greece)</i>	231
372 Analysis of a transmembrane pressure (TMP) jump prediction model for preventing TMP jumps <i>Hiromasa Kaneko, Kimito Funatsu (Japan)</i>	232

373 Renewable energy desalination: Performance analysis and operating data of existing RES-desalination plants <i>A. Cipollina (Italy), E. Tzen (Greece), V. Subiela (Spain), M. Papapetrou, J. Koschikowski, M. Wiegand (Germany), G. Zaragoza (Spain)</i>	233
377 Design, manufacturing and successful validation of first 3D printed filtration cell <i>H. Vervoort, G. Blandin (Belgium), P. Le-Clech (Australia), A. Verliefde (Belgium)</i>	233
378 Lipid production by microalgae <i>Chlorella pyrenoidosa</i> cultivated in palm oil mill effluent (POME) using hybrid photo bioreactor (HPBR) <i>Hesam Kamyab, Mohd Fadhil Md Din, Chew Tin Lee, Ali Keyvanfar, Arezou Shafaghat, Muhd Zaimi Abd Majid, Mohanadoss Ponraj, Thian Xiao Yun (Malaysia)</i>	234
379 25% energy consumption reduction of the Dhekelia Desalination Plant in Cyprus without replacing any part of the existing equipment <i>Olga Sallangos (Cyprus)</i>	235
380 Comparison between second pass permeate water reverse osmosis unit (PWRO's) and boron selective resins (BSR's) for the removal of boron from seawater <i>Olga Villa Sallangos, Demetris Yiannaki, Christos Mammides (Cyprus)</i>	235
381 Garillis Aquifer brackish water desalination — A case study <i>Christina Christou, Nicos Christodoulou (Cyprus)</i>	236
382 Quality considerations from integrating desalinated water into existing water infrastructure <i>Joanna Philippou (Cyprus)</i>	236
383 Leachate treatment by different ceramic membranes <i>Aissa Belouatek, Boubekeur Asli, Abdelkader Chougui, Khaled Zaiter (Algeria)</i>	237
384 Modeling an innovative low-temperature desalination system with integrated cogeneration in a concentrating solar power plant <i>Johannes Wellmann, Karl Neuhäuser, Frank Behrendt (Egypt), Mark Lehmann (Switzerland)</i>	238
385 Engineering design of Dakhla brackish water demineralization plant <i>Kantilaftis Evangelos (Italy), Kharif Mohammed, Amine Mohammed (Morocco)</i>	238
386 Mechanical vapor compression (MVC) desalination system optimal design <i>Adel El-Feky (Egypt)</i>	239
387 Modeling of wind energy on isolated area <i>Hachemi Glaoui, Ismail Messaoudi, Hamid Saab (Algeria)</i>	239
390 Membrane separation and sonication in bio-ethanol production <i>Marietta Ábel, Gábor Keszthelyi-Szabó, Dóra Vitay, Cecilia Hodúr (Hungary)</i>	240
391 Economic analysis of an electricity and desalinated water cogeneration plant in Cyprus <i>Nestor Fylaktos, Indradip Mitra, George Tzamtzis, Costas N. Papanicolas (Cyprus)</i>	241
392 Effect of pretreatment on DCMD performance in the treatment of synthetic wastewater <i>Meng-Shun Huang, Po-I Liu, Chia-Hua Ho, Ren-Yang Horng, Teh-Ming, Liang, Pi-Lien Hsiao, Tsui-Jung Yang (Taiwan)</i>	241
400 Detection of low concentration of assimilable organic carbon in seawater prior to reverse osmosis membrane using microbial electrolysis cell biosensor <i>SB. Quek, L. Cheng, R. Cord-Ruwisch (Australia)</i>	242
401 8-year uninterrupted operation of the autonomous solar photovoltaic reverse osmosis system in Ksar Ghilène (Tunisia) <i>Baltasar Peñate, Vicente J. Subiela, Fayna Vega, Fernando Castellano, F. Julián Domínguez, Vanessa Millán (Spain)</i>	243
402 Influence of site-specific parameters on environmental impacts of desalination <i>Maedeh P. Shahabi, Martin Anda, Goen Ho (Australia)</i>	243
403 New module design development for membrane distillation <i>B. Nelemans (The Netherlands)</i>	244
404 Biofouling control of membrane systems by phosphate limitation <i>M.J. Boorsma, S. Chauveau, J.S. Vrouwenvelder (The Netherlands)</i>	245
405 Numerical investigation on characteristics of falling water film in horizontal tube falling film evaporator <i>Qing-gang Qiu, Wei-guo Jiang, Chang-ping Wang, Sheng-qiang Shen (China)</i>	246

406 Mega projects as a path to peace <i>Abdulrahman Tamimi (Palestinian Authority)</i>	247
407 Bacterial TEP removal by DEAE anion exchange: a pretreatment of NF <i>Sheng Li, Harvey Winters, Gary Amy (Saudi Arabia)</i>	247
408 Study of reverse osmosis treatment for micropollutants rejection in advanced water reuse applications <i>C. Martínez, V. Gómez, D. Dubert, K. Majamaa, E. Pocurull, F. Borrull (Spain)</i>	248
409 Sustainable water: meeting needs <i>Richard Darton (UK)</i>	249
410 Investigation of water decolorization by Fenton oxidation process in batch and continuous systems <i>M. Nurbas, S. B. Kutukcuoglu (Turkey)</i>	249
411 Reducing desalination industry risk through collaboration with other ocean industries <i>Paul Holthus (USA)</i>	250
412 Desalination from the perspective of a bacterial cell - and the human on the other end of the microscope <i>Harry F. Ridgway (USA)</i>	250
413 Organic fouling effect in pressure retarded osmosis process and its efficient cleaning method <i>Dongwoo Suh, Hongsik Yoon, Jihyun Yu, Jeyong Yoon (Korea)</i>	251
414 Higher boron rejection with a new TFC forward osmosis membrane <i>R. Valladares Linares, Z.Y. Li (Saudi Arabia), S. Sarp, Y.G. Park (Korea), G. Amy (Saudi Arabia), J.S. Vrouwenvelder (Saudi Arabia and the Netherlands)</i>	252
415 Climate change impact assessment of water resources in Georgia (Kakheti Region) <i>Kakha Nadiradze, Nana Phirosmanashvili (Georgia)</i>	252
416 Coagulation and ultrafiltration in seawater reverse osmosis pretreatment <i>Assiyeh Tabatabai (The Netherlands)</i>	253
Author Index	255