



# Desalination

## From theory to practice

### People, Papers, Publications

Gulf Europe  
WSTA EDS

Miriam Balaban  
EDS Secretary General



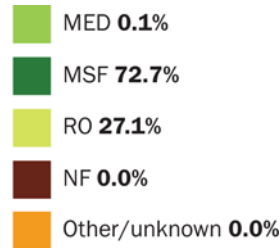
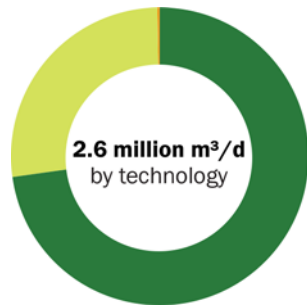


# Europe and the Gulf Region

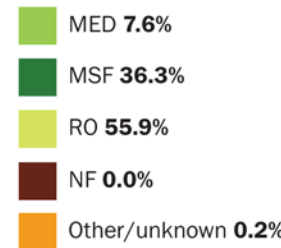
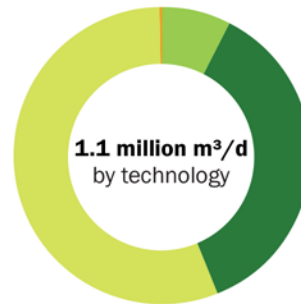
The collaboration between our regions has had significant impact on the development of desalination based on innovation and upscaling opportunities. Over the years research and development have led to the significant application of desalination technology and industry to ensure the water security in our regions and provided information and partnerships to other regions of the world.

Data on publications, people and plants and processes will be presented.

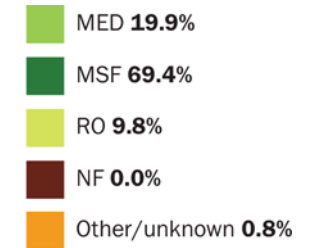
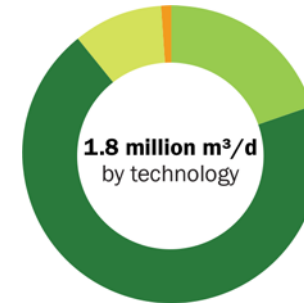
# CUMULATIVE INSTALLED DESALINATION CAPACITY, 2015



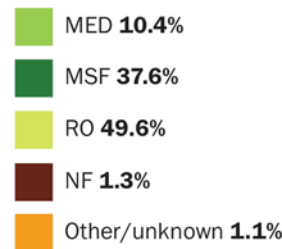
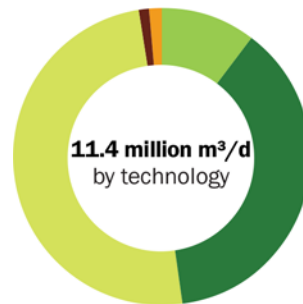
KUWAIT  
2.6 M m<sup>3</sup>/d



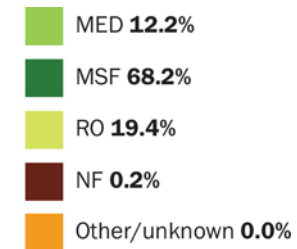
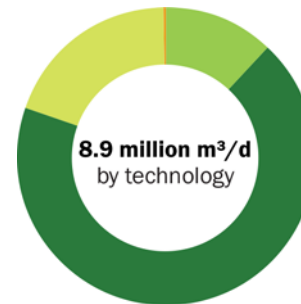
OMAN  
1.1 M m<sup>3</sup>/d



QATAR  
1.8 M m<sup>3</sup>/d



SAUDI ARABIA  
11.4 M m<sup>3</sup>/d

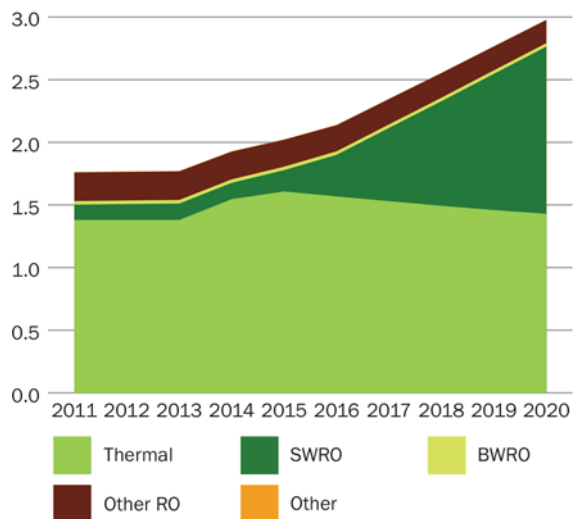


UAE  
8.9 M m<sup>3</sup>/d

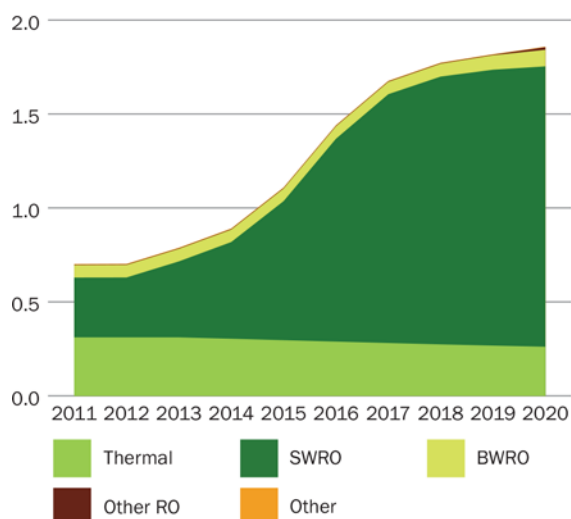
Source: GWI DesalData, 2016

# CUMULATIVE ONLINE CAPACITY, million m<sup>3</sup>/d

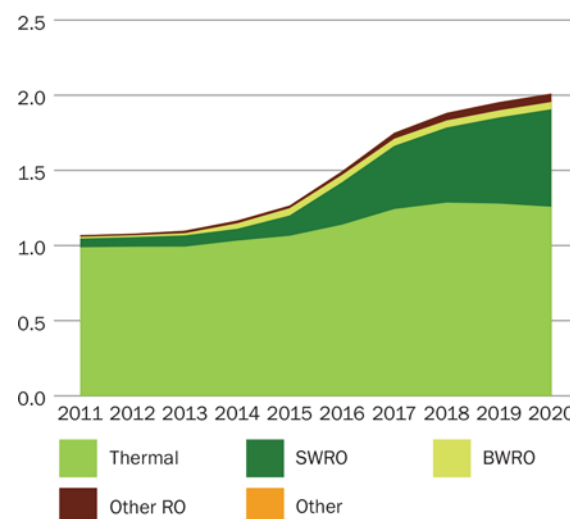
## KUWAIT



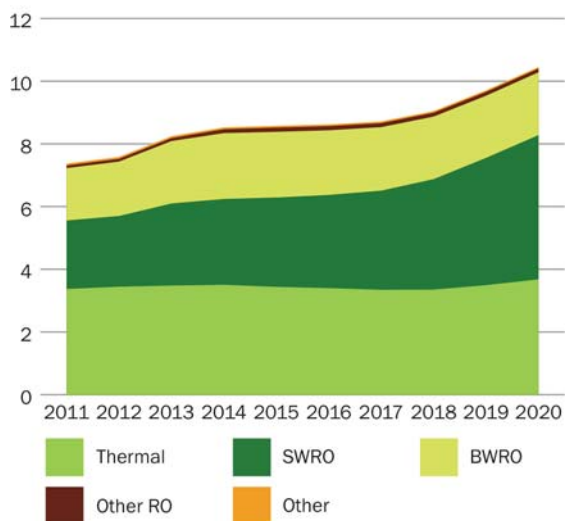
## OMAN



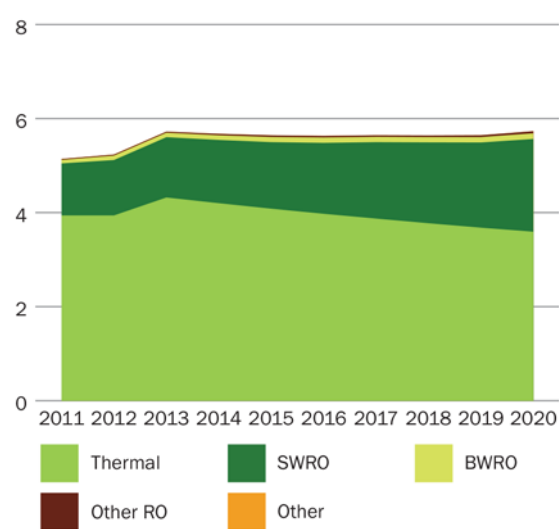
## QATAR



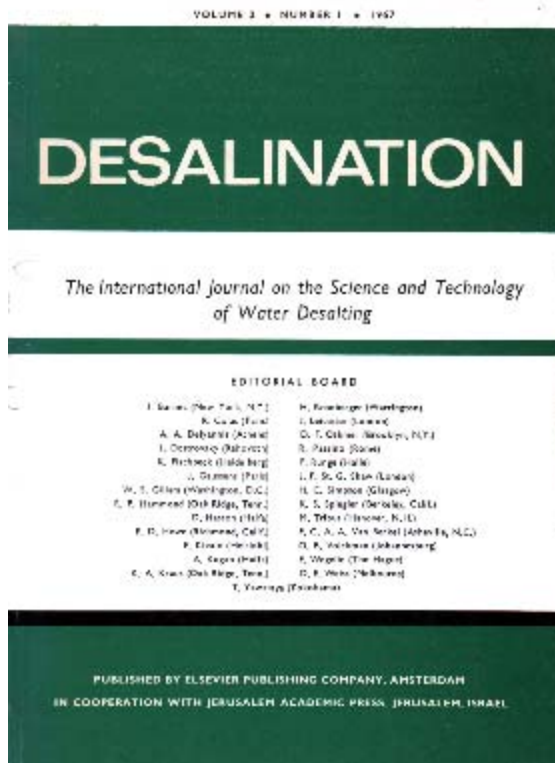
## SAUDI ARABIA



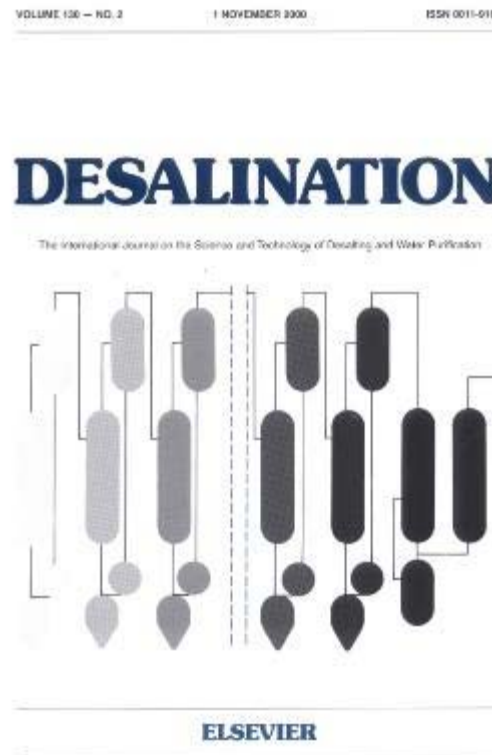
## UAE



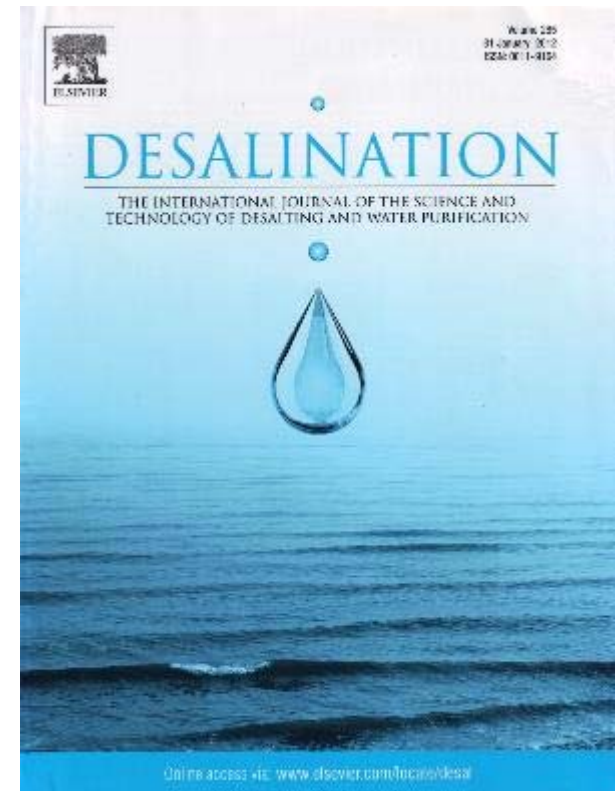
Source: GWI DesalData, 2016



**1966–1975**

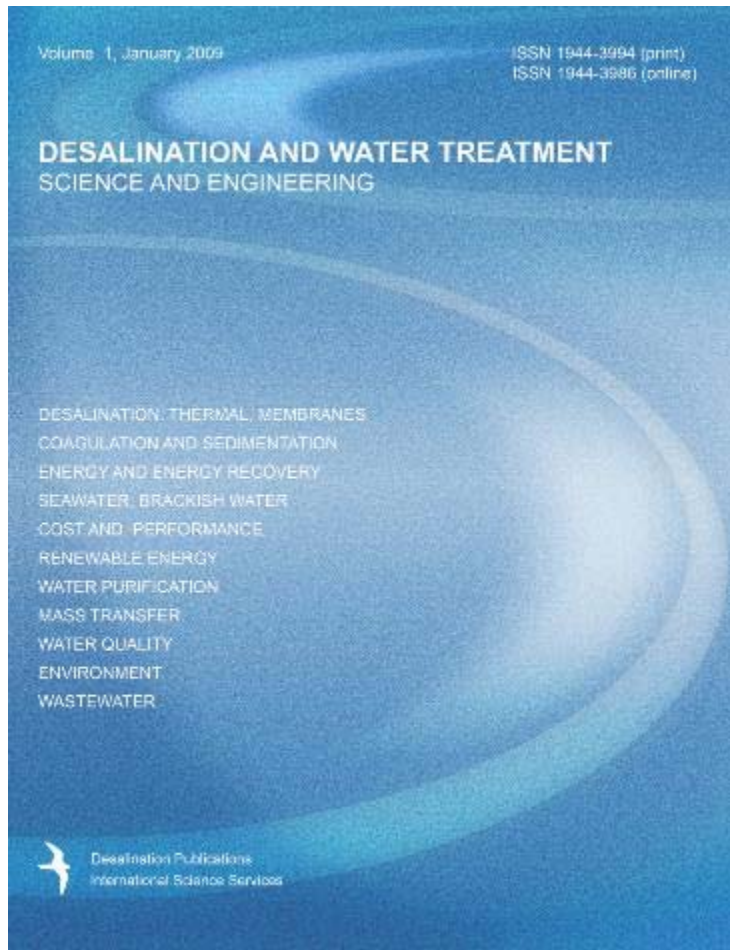


**1976–2009**



**2010–2016**

**Miriam Balaban, Founder, Editor-in-Chief 1966–2010**



# *Desalination and Water Treatment*

**Miriam Balaban**

**Editor-in-Chief  
Founder, 2009**

**2009–2016+**

**1966–1975**  
**Papers 539**  
**Countries 20**

**1976–1985**  
**1300**  
**46**

**1986–1995**  
**1277**  
**56**

**1996–2005**  
**3048**  
**75**

**2006–2015**  
**6313**  
**94**

**TOTAL**  
**1966–2015**

# Desalination

## 1966–2015

## (49 years)

## 12,478 Articles

## 118 Countries

## GCC countries

## Saudi Arabia 266

## Kuwait 214

## UAE 192

## Bahrain 43

## Oman 43

## Qatar 20

USA	227	USA	328	USA	264	France	211	China	928	USA	1266
UK	71	Japan	137	Japan	97	USA	191	India	400	China	1146
Israel	63	Germany	121	Germany	81	Germany	186	Spain	337	Germany	621
France	30	Italy	88	Italy	80	Spain	153	Iran	327	India	575
Japan	25	Israel	86	Kuwait	79	UK	147	Korea	315	France	520
Germany	18	UK	60	Saudi Arabia	79	China	118	Turkey	271	Spain	513
Italy	18	France	56	China	68	Poland	113	USA	256	UK	506
Russia	18	The Netherlanc	46	India	57	Italy	112	Australia	235	Italy	488
Australia	11	Saudi Arabia	42	Italy	48	The Netherlanc	103	Italy	220	Japan	476
Canada	8	Sweden	33	UK	48	Kuwait	94	Germany	215	Korea	402
Spain	8	India	32	Japan	93	Japan	93	France	201	Australia	374
The Netherlanc	8	China	31	South Africa	33	Algeria	89	UK	180	Israel	364
South Africa	6	Denmark	26	Egypt	31	Egypt	89	Greece	169	Iran	354
Belgium	5	Australia	25	Sweden	29	Poland	169	Poland	169	Turkey	329
India	5	Egypt	25	Israel	28	Malaysia	159	Malaysia	159	Poland	309
Austria	3	Russia	23	France	23	Taiwan	142	Taiwan	142	Saudi Arabia	266
Hungary	3	Libya	14	Australia	22	Egypt	134	Egypt	134	Egypt	261
Kuwait	2	South Africa	14	Canada	19	Algeria	132	The Netherlanc	71	The Netherlands	247
Sweden	2	Canada	13	The Netherlands	19	Japan	124	Japan	124	Greece	228
Turkey	2	Mexico	12	Poland	17	Tunisia	102	Tunisia	102	Algeria	221
Poland	1	Switzerland	10	Greece	11	Israel	96	Israel	96	Kuwait	214
UAE	1	Poland	9	Spain	11	Canada	74	Canada	74	Russia	200
Yugoslavia	1	UAE	8	Bahrain	10	Singapore	71	Singapore	71	UAE	192
Bulgaria	1	Spain	8	Bulgaria	10	Greece	44	The Netherlanc	71	Malaysia	190
Chile	1	Bulgaria	7	Denmark	7	Jordan	32	Saudi Arabia	58	Tunisia	187
Croatia	1	Kuwait	7	Croatia	5	Singapore	31	Jordan	52	Taiwan	175
Denmark	1	Belgium	4	Switzerland	5	Taiwan, ROC	29	Brazil	51	Canada	161
		Greece	4	Belgium	4	Morocco	29	Portugal	47	Sweden	107
		Turkey	4	Jordan	4	Malaysia	28	UAE	47	Singapore	106
		Czech Republic	3	Singapore	4	Russia	44	Russia	44	South Africa	92
		Iran	3	Taiwan	4	Hungary	38	Hungary	38	Jordan	88
		Virgin Islands	3	Austria	3	Belgium	34	Belgium	34	Portugal	76
		Bahrain	2	Finland	3	Czech Republic	32	Czech Republic	32	Belgium	71
		Norway	2	Korea	3	Kuwait	32	Kuwait	32	Brazil	69
		Serbia	2	Libya	3	Denmark	29	Denmark	29	Denmark	66
		Argentina	1	Malaysia	3	Mexico	27	Mexico	27	Hungary	65
		Austria	1	Malta	3	Thailand	27	Thailand	27	Morocco	58
		Croatia	1	Portugal	3	Finland	26	Finland	26	Finland	55
		Finland	1	Tunisia	3	Serbia	26	Serbia	26	Libya	52
		Hungary	1	Argentina	2	Libya	20	Denmark	20	Czech Republic	45
		Korea	1	Czech Republic	2	Brazil	18	Norway	20	Oman	43
		Oman	1	Hungary	2	Austria	16	Austria	19	Argentina	43
		Puerto Rico	1	Philippines	2	Cyprus	15	Sweden	19	Bahrain	43
		Romania	1	Syria	2	Denmark	11	Qatar	18	Austria	42
		Saint Christoph	1	Bangladesh	1	Serbia	11	Libya	17	Mexico	40
		Yugoslavia	1	British West Indi	1	Switzerland	10	Pakistan	17	Serbia	40
				Guam	1	Czech Republic	8	South Africa	17	Switzerland	38
				Indonesia	1	Palestinian Aut	8	Argentina	16	Thailand	34
				Iraq	1	Bulgaria	7	Oman	16	Bulgaria	29
				Mexico	1	Croatia	7	Ukraine	15	Croatia	26
				Oman	1	Thailand	6	Slovenia	14	Norway	26
				Qatar	1	Ukraine	5	Romania	13	Cyprus	24
				Sudan	1	Indonesia	4	Switzerland	13	Qatar	20
				Thailand	1	Norway	4	Iraq	12	Ukraine	17
				Turkey	1	Qatar	4	Croatia	10	Pakistan	17
				Virgin Islands	1	Hong Kong	3	Cyprus	9	Slovenia	17
						Kazakhstan	3	Ghana	9	Iran	16
						Lebanon	3	Ireland	9	Romania	15
						Slovak Republic	3	Nigeria	9	Chile	13
						Slovenia	3	Chile	8	Indonesia	13
						Bermuda	2	Indonesia	8	Palestinian Authority	13
						Lithuania	2	New Zealand	8	Ghana	9
						Mexico	2	Bahrain	5	Ireland	9
						Puerto Rico	2	Hong Kong	5	Nigeria	9
						Syria	2	Palestinian Aut	5	Hong Kong	8
						Azerbaijan	1	Slovak Republic	5	New Zealand	8
						Belarus	1	Bulgaria	4	Slovak Republic	8
						Chile	1	Lebanon	4	Syria	8
						Colombia	1	Syria	4	Lebanon	7
						Malta	1	Latvia	3	Lithuania	4
						Netherlands Ar	1	Malawi	3	Malta	4
						Philippines	1	Yemen	3	Puerto Rico	4
						Romania	1	Brunei	2	Virgin Islands	4
						Uzbekistan	1	Cameroon	2	Yugoslavia	4
								Colombia	2	Colombia	3
								Cuba	2	Kazakhstan	3
								Estonia	2	Latvia	3
								Lithuania	2	Malawi	3
								Trinidad and Tr	2	Philippines	3
								Yugoslavia	2	Yemen	3





*Desalination 1 (1966) 77–95*

HISTORY, EXPERIENCE AND ECONOMICS  
OF WATER PRODUCTION IN KUWAIT\*

M. H. ALI EL-SAIE

*Ministry of Electricity and Water, Kuwait*

INTRODUCTION

Kuwait had practically no potable water and was relying, between 1925–50, on a very limited supply of imported water from Shat Al-Arab, Iraq, by boat. In 1950, the Kuwait Oil Company supplied the city with 80,000 igpd.\*\* H. H. The Amir of Kuwait ordered the first one million igpd submerged tube sea water distillation plant which produced water in 1953 and this was followed in 1955 by a similar plant of one million gallon capacity. Then in 1957, the first of four 1/2 million igpd flash type evaporators was commissioned. In 1960 another flash evaporation plant was commissioned which consists of two units each of one million igpd capacity. Five 1 million igpd plants are under construction and will be commissioned soon.

# Working Party on Fresh Water from the Sea

Chairman Prof. Anthony Delyannis

**1967, Athens, Greece**  
**International conference on**  
**Fresh Water from the Sea**

Athens 1967

Dubrovnik 1970

Heidelberg 1973

Alghero 1976

Las Palmas 1978

Amsterdam 1980

Florence 1983

Cannes 1987

Kuwait 1989

**50 years**



Left to right: R.S. Silver, M. Balaban,  
K. Kraus, K. Fischbeck  
Above: Zeus

*Desalination* 1 (1966) 35–49

A COMPOSITE TUBULAR ASSEMBLY FOR REVERSE OSMOSIS  
DESALINATION

SIDNEY LOEB

*Department of Engineering, University of California, Los Angeles, Calif. (U.S.A.)*

(Received December 6, 1965)



ELSEVIER

*Desalination* 120 (1998) 247–262

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**DESALINATION**

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Energy production at the Dead Sea by pressure-retarded osmosis:  
challenge or chimera?

Sidney Loeb

# The First Commercial Membrane Desalination Plant at Coalinga, CA, 1965



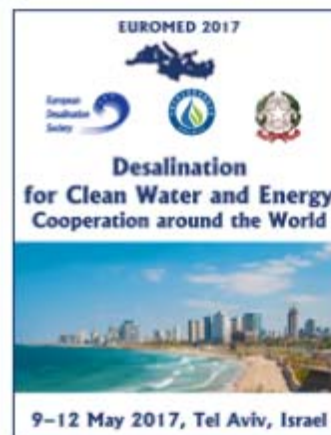
- This 5,000 GPD plant, dubbed "Raintree" produced drinking water from brackish water for the 5,000 residents of Coalinga CA (60 mi SW of Fresno). Sidney Loeb and Prof. J. W. McCutchan are shown on the left.

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- Courses
- EDS Membership
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- Publications
- OSW / OWRT
- Patents
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**Desalination and Water Treatment Journal**



**EuroMed 2017**

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**European Desalination Society**  
 Dissemination of information  
 about the following  
 European Union Projects



Low energy solution  
 for drinking water  
 production by a  
 revival of ED systems

[www.desline.com](http://www.desline.com)

**Desalination Directory** – about 35,000 entries of those concerned with desalination and water treatment

**Average per day**

Visits **1,330**

Hits **12,546**

Individuals  
 Organizations

**Total**  
**30,573**  
**4,439**

**Gulf**  
**1378**  
**256**

# IDEA International Congress on Desalination and Water Reuse, Bahrain, 1981



**Plant visit  
to Jubail,  
Saudi Arabia**



## Kuwait water towers



Visiting Jubail, 1981



