arwadex 2017

تحت رعاية معالي رئيس مجلس الوزراء المصري المهندس شريف إسماعيل
مؤتمر تحلية المياه الحادي عشر في البلدان العربية
UNDER THE PATRONAGE OF THE EGYPTIAN PRIME MINISTER ENGINEER SHERIF ISMAIL
11TH WATER DISALINATION CONFERENCE IN THE ARAB COUNTRIES
18-19 APRIL 2017 • INTERCONTINENTAL CITY STARS - CAIRO - EGYPT

Third Direction Consulting

Shaping the Future of The Water Industry

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Saudi Arabia

بالتعاون مع
Holding Company for Water & Waste Water
وزارة الاسكان والمرافق والمجتمعات العمرانية

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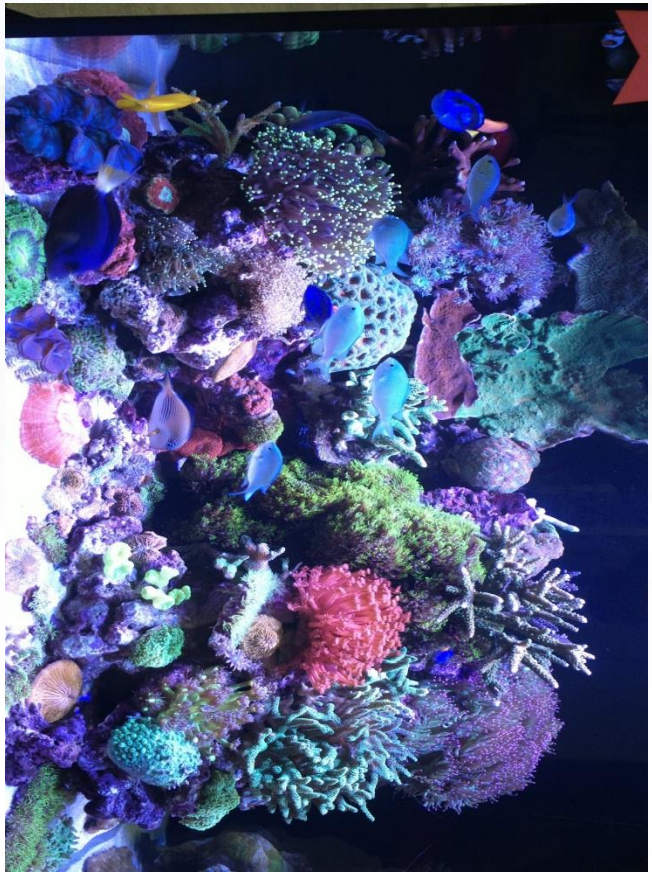
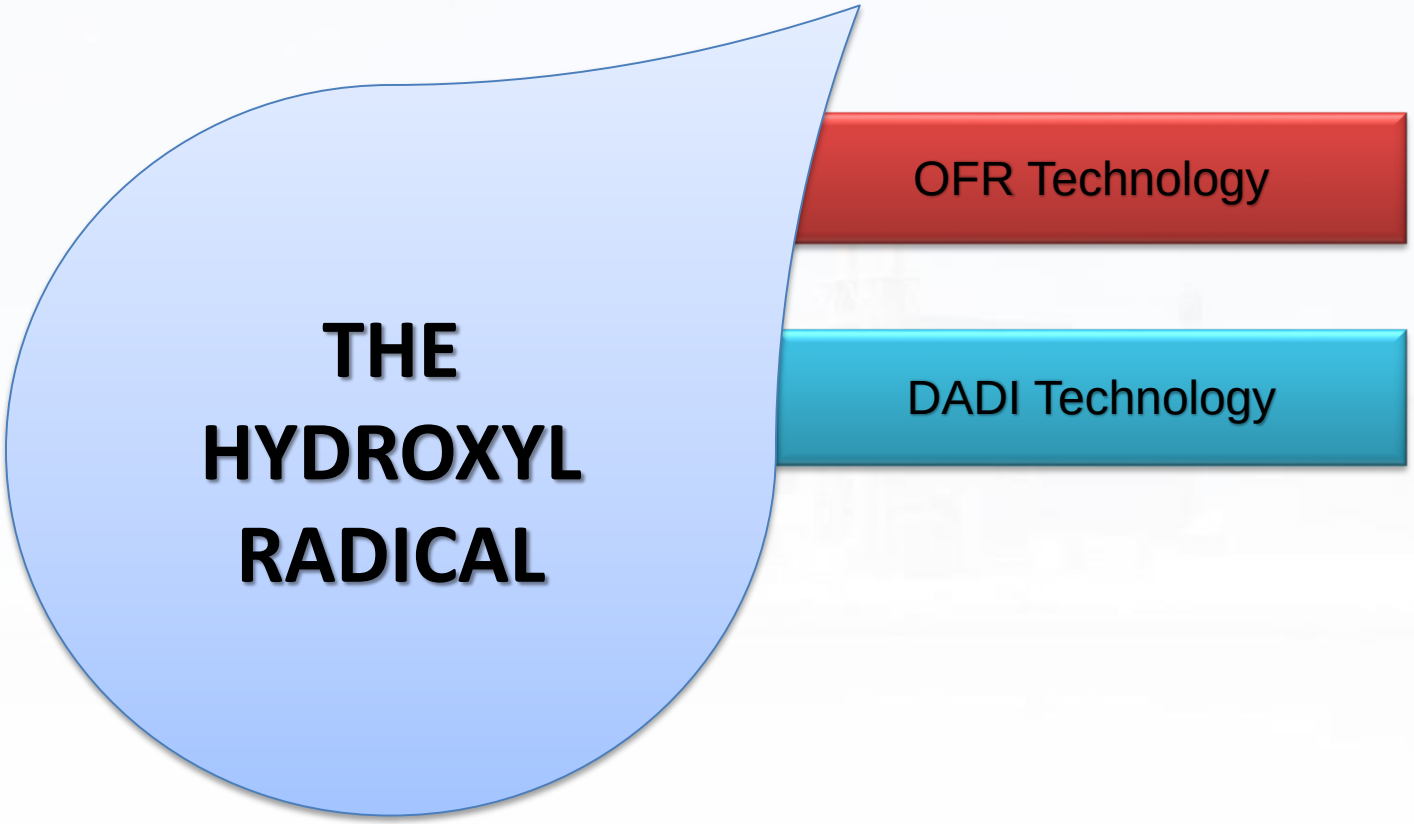
THE UGLY

THE GOOD



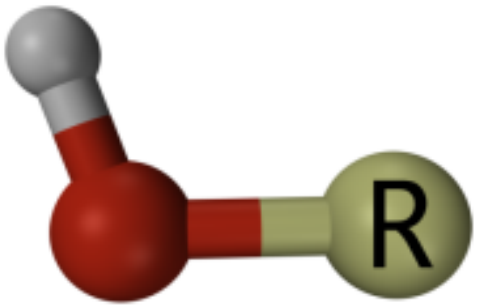
WATER TO TREAT WATER

NO CHEMICAL


THE HYDROXYL RADICAL
OFR Technology
DADI Technology

THE HYDROXYL RADICAL

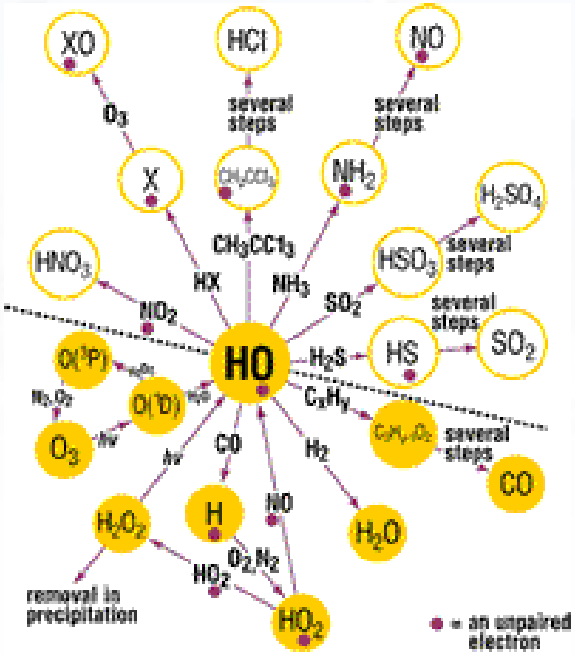
The hydroxyl radical, OH·, is the neutral form of the hydroxide ion (OH–). Hydroxyl radicals are highly reactive and consequently short-lived; however, they form an important part of radical chemistry. Most notably hydroxyl radicals are produced from the decomposition of hydro-peroxides (ROOH) or, in atmospheric chemistry, by the reaction of excited atomic oxygen with water.



Molecular orbital of the hydroxyl radical with unpaired electron

HYDROXYL EFFECTS ON ORGANICS

The hydroxyl radical is often referred to as the "detergent" of the troposphere because it reacts with many pollutants, often acting as the first step to their removal. It also has an important role in eliminating some greenhouse gases like methane and ozone



The high oxidizing properties of ·OH radicals is highly effective in breaking down long organic chains.

Hydroxyl Application in our Technologies

OFR TECHNOLOGIES

DADI TECHNOLOGIES

Third Direction Consulting

THE HYDROXYL RADICAL

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SHR

The Static Hydro Reactor utilizes multi-function media modules and compressed air to breakdown and treat specific pollutants in wastewater.

DHR

The DHR system is the ideal solution for the economical treatment of waste water containing a high concentration (COD >100,000) of organic pollutants or other chemical waste including

Industrial Waste Water Treatment

- Spent Caustic Treatment / regeneration
- Ammonia Removal
- Heavy Metal Removal
- Cooling Tower Blow down
- Oily Water Treatment
- High COD waste water treatment

OFR			
Name of Stream	**Parameters**	**Before Treatment**	**After Treatment**
Spent caustic	COD	1,330 ppm	143 ppm
	TOC	337 ppm	36 ppm
Ammonia Removal	Ammonia	90 mg N/L	20 mg N/L
High COD	COD	705,000 ppm	273,000 ppm
Oily Water	Oil & Grease	13.1 ppm	0.3 ppm

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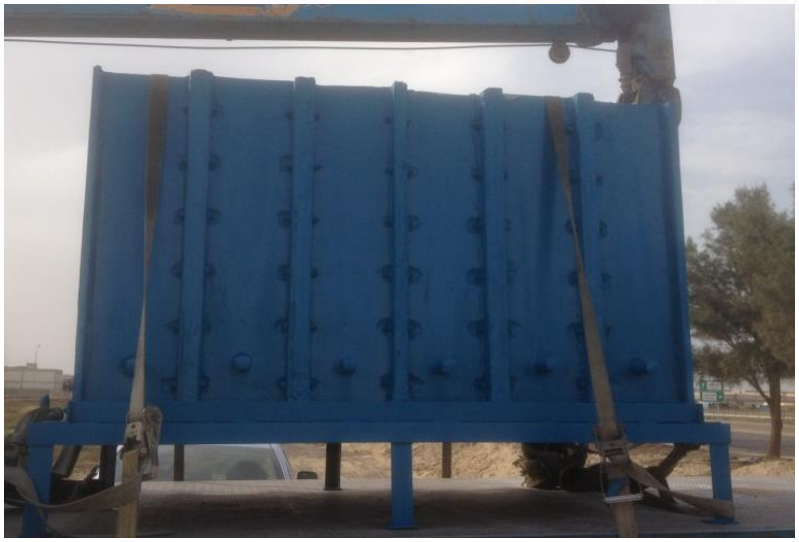
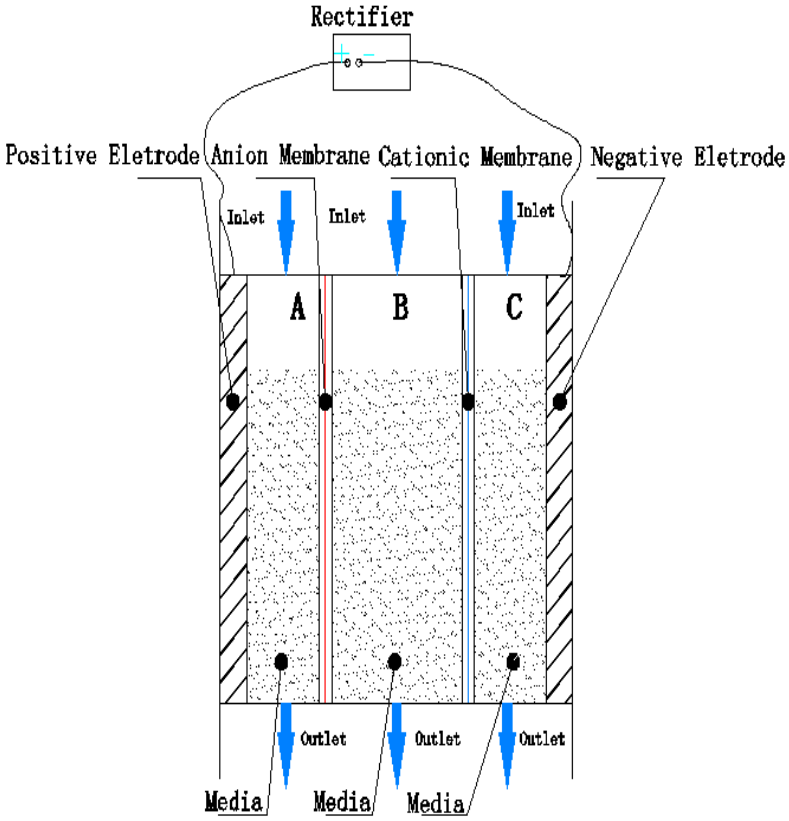
DADI

The DADI technology Is an Advanced Oxidation Process utilizes special media and tailored ion exchange membrane to treat High TDS water and many other wastewater with extremely high contaminants such as Spent Caustics.





DADI

- Industrial Waste Water
- Desalination Plant Reject recovery
- UF Reject Recovery
- High TDS (>300,000 ppm) Reduction.

Industrial Waste Water

DADI UNIT			
		Before Treatment	After Treatment
Ammonia Removal	Ammonia	40 mg N/L	0.4 mg N/L
Heavy Metals	IRON	3 ppm	0.1 ppm
	ZINK	18 ppm	<0.05 ppm
	Zirconium	41 ppm	0.189 ppm
	Aluminum	19000 ppm	0.90 %
Cooling Tower (Blow Down)	Chloride	17 ppm	8 ppm
	Turbidity	208	3
	Phosphorus	3 ppm	0.2 ppm
High COD	COD	1600 ppm	29.6 ppm

Sea Water Desalination

Source	Parameter	Before Treatment	After Treatment
Sea water	TDS (mg/L)	47,300	76.7
	Conductivity (µs/cm)	70,800	169
	TSS (mg/L)	326	34

Source	Parameter	Before Treatment	After Treatment
RO Reject	TDS (mg/L)	19,200	1,600
Thermal	TDS (mg/L)	83,600	2,060
UF Reject	TDS (mg/L)	5,960	810

Spent Caustic

Source	Parameters	Before Treatment	After Treatment
Spent Caustic	TDS (mg/L)	67,000	7,870
	Sulfide S^{--}	2,680	<0.1

Source	Parameters	Before Treatment	After Treatment
Salty Stream	TDS (mg/L)	52,915	7,213
	Phenol (mg/L)	22.28	<0.1
	TOC (mg/L)	5,135	792
	TSS (mg/L)	220	42

Source	Parameters	Before Treatment	After Treatment
LAO spent Caustic	Zirconium percentage	40.58 %	0.02% in water
			84% in Powder after Dry

Source	Parameters	Before Treatment	After Treatment
LAO spent Caustic	Aluminum (mg/l)	19,000	1,900

DADI for Spent Caustic Regeneration

	Chamber B				Chamber A Acidic wt%	Chamber C Alkaline wt%
	TOC (mg/l)	COD (mg/l)	TDS (mg/l)	Oil & Grease		
Raw S. Caustic (LAO)	5210	11600	324000	13.1	0.189	1.876
After Treatment	449	1410	110000	< 0.3		
Reduction %	91%	88%	66%	97.80%		

	Chamber B				Chamber A Acidic		Chamber C Alkaline wt%
	TOC (mg/l)	COD (mg/l)	TDS (mg/l)	Sulfide (S)	HCL wt%	H2So4 wt%	
Raw Spent Caustic	423	1990	67000	2680	0.05	0.08	1.03
After Treatment	318	895	7870	< 0.1			
Reduction %	27%	55%	88%	99.99%			

Oxidation Technology Comparison

	Our Tech.	WAO	Ozone	Fenton
Temp	Normal	High > 200	No	No
Pressure	No	High 2- 30 Bar	No	No
Chemical	No	No	No	Extensive
Hazard	No	Yes	yes	yes
Power	Low DC	High	High	Low
Capex	Low	V. High	High	High
Opex	Low	V. High	V. High	V. High
Flexibility	Flexible Modules	Batch Process	Difficult	Difficult
Op Safety	Safe	Dangerous	Toxic	Toxic
By Product	Waste the Wealth	No	Partial Oxidation	Sludge
Life Span	20 years	Corrosive less life	Corrosive less life	High Maintenance
Oxidation strength	OH. Normal Condition	OH. Extreme Condition	O3 low Oxidation	H2O2 low Oxidation

Thank You

Innovative Solutions For Sustainable World