

# CaribDA News

Volume 3, Issue 2

Spring Issue 2013



## MESSAGE FROM THE PRESIDENT

BY: MANUEL PEREIRA, Aqualetra Production

Dear CaribDA Members and Friends,

On behalf of the CaribDA Board, I would like to thank you all for your continued support of our organization. We have been actively increasing our membership and focusing on enhancing the benefits to our members. Remember that Membership Dues are due in June; there are a lot of new and exciting things happening in the Caribbean Desalination Association and you don't want to miss out.

There has been an increasing focus on operator training in the Caribbean and we are looking forward to our Biennial Conference & Exposition that will be held in St. Thomas in June 2014. This Conference enables valuable learning, information sharing and networking amongst key operations staff from the region and beyond. It will be an event you wouldn't want to miss!

Your feedback is very important for improving the organization. During and after the conference we are growing in members, we need your input so don't hesitate and feel free to be part of your organization contributing with e.g. new ideas, sending information to be published and be part of any committee.

## PROGRAM COMMITTEE REPORT

BY: JOHN THOMPSON, Desalination Company of Trinidad & Tobago Limited (Desalcott)

The CaribDA biennial conference and expo "Drought-Proofing the Caribbean" has now been set to be held at the Marriott Frenchman's Reef and Morningstar Resort, St. Thomas, US Virgin Islands June 24-27, 2014. A preliminary program for the event has been drafted and a call for papers has been issued, with abstracts due by November 1, 2013. The speaker [abstract submission form](#) is now available on the [CaribDA website](#).

"Call for Papers" on page 5-6

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## THE CARIBDA NEWS NEEDS YOUR INPUT!

- ◆ Share your experiences with others!
- ◆ Take this opportunity to place your company or plant in the news!
- ◆ Member contributions are welcomed. Please contact us by email at: [publications@caribda.com](mailto:publications@caribda.com)
- ◆ Please contact us if you are interested in joining the editorial staff.

# LETTER FROM THE EDITOR

**BY: JUAN MIGUEL PINTO**

Dear Readers,

Happy Winter's End and Hello Spring!

I hope the year is proving to be a productive and meaningful year so far. I am very pleased to share this April edition of CaribDA, chock full of the regions' latest business and news related to the desalination industry. But first, I have an interesting technological breakthrough story that I'd like to talk about.

When we refer to water treatment, we think seawater and brackish water desalination, or reuse, right? I can't help but think that there are other sources out there.

In fact, it's called produced water. Produced water is natural water from underground formations, brought to the surface during oil or gas production. Produced water is one of the potential sources for water treatment. According to the U.S. Department of Energy, the water to oil / gas ratio (WOR) averages seven barrels of water to one of oil. In the worst cases, the WOR reaches 50 to 1.

You see, early in the life of an oil well, oil production is high and water production is low. Over time, oil production decreases and water production increases.

The cost of managing such a large volume of water is a key consideration to oil and gas producers. Previous nationally produced water volume estimates are in the range of 15 to 20 billion barrels (bbl; 1 bbl = 42 U.S. gallons) generated each year in the United States. This is equivalent to a volume of 1.7 to 2.3 billion gallons per day (CE Clark and Veil – September/2009)

Produced water properties (both physical and chemical) and volume vary considerably depending on geographic location of the field, the geological formation, the type of hydrocarbon product being produced, and the lifetime of a reservoir. The major concerns of produced water are: salt content, oil and grease, various natural inorganic, and organic compounds or chemical additives used in drilling among other processes involved in oil and gas upstream production. Therefore, produced water treatment could be a challenge.

I naturally think, are we ready for this new application? Is there a scalable and environmentally sound solution to desalt produced water? For more on this and related topics, see this recent [coverage from NBC news](#). If you have any questions or comments, please email me: [jmpinto@energyrecovery.com](mailto:jmpinto@energyrecovery.com). In the meantime, I hope I've given you some food for thought.

Sincerely,

Juan Miguel Pinto  
CaribDA Publications Chair

## CARIBDA 2014 CONFERENCE & EXHIBITION: CALL FOR PAPERS



CaribDA 2014 Conference & Exhibition  
***“Drought-Proofing the Caribbean”***

June 24<sup>th</sup> – 27<sup>th</sup> 2014

*Venue: Frenchman's Reef & Morningstar  
Marriott Beach Resort,  
St. Thomas, USVI*



**The deadline for submission of abstracts is November 1, 2013**

*(Please note that all papers will be due on March 17, 2014 and PowerPoint Presentations will be due by April 14, 2014).*

### **SUBMISSION OF ABSTRACTS**

**Call for Abstracts:** CaribDA will coordinate a three-day program of technical presentations and posters. We invite you to submit abstracts on the subjects of desalination and waste water reuse and related topics listed below *(please use these reference numbers in your submittal)*:

*(Continued on page 3)*

# CARIBDA 2014 CONFERENCE & EXHIBITION: CALL FOR PAPERS

(Continued from page 2)

1. **Technology & Innovations**
2. **Planning & Management**
3. **Finance & Economics**
4. **Regulations and the Environment**
5. **Seawater Reverse Osmosis Applications**
6. **Desalination using Green Energy**
7. **Thermal Desalination**
8. **Other**

## Submit to:

Abstracts must be submitted in the **original MS Word** to CaribDA via email at [abstract@caribda.com](mailto:abstract@caribda.com). If the file is too large to send via email, send to CaribDA's YouSendIt address: <http://dropbox.yousendit.com/eventassist> by the deadline.

All abstracts must be submitted with the following information included as the first page of the abstract:

### Page 1 (Submittal & Contact Information):

- Applicable Session(s) (listed on Page 2 of the Call for Papers – please reference a Primary Session or, if applicable, an Alternate Session as well)
- Title of Paper
- Primary Author: salutation, first name, middle initial, last name, suffix, job title, company, mailing address, phone, cell, fax, email and website
- Biography of Primary Author to be included (brief one paragraph)
- Co-Author(s): include all information listed above for each Co-Author
- Presenter's name (only one Presenter will be allowed for each Paper)
- Contact person, title, phone, and email
- Disclosure if subject matter previously presented or published (when and where)

### Page 2 (Abstract of Paper):

- Abstracts should be a full page, single-spaced, approximately 200-500 words in length and provide an overview of the paper and its relevance to the theme of the Conference.

If you have any questions, please contact CaribDA at 772-781-8507.

## CAWASA NEWS FLASH

**BY: VICTOR POYOTTE**, Executive Director, The Caribbean Water & Sewerage Association, Inc.

CAWASA is please to announce the upcoming 2013 Water Operators Conference. This two-day conference will be held in Antigua from June 27-28, 2013 in collaboration with Host Utility, the Antigua Public Utilities Authority (APUA) and the CReW Project.

For more information please contact the CAWASA Secretariat, Suzanne Joseph at [sjoseph@cawasa.org](mailto:sjoseph@cawasa.org), (758) 458 0601 or (758) 285 7963.

## CWWA NEWS FLASH

**BY: MARIAN STEPHEN**, Caribbean Water and Wastewater Association (CWWA)

PAHO is preparing a roster of consultants with working expertise in the following:

1. Desalination processes;
2. Water loss management from the operational perspective; and
3. Water Quality Control from the operational perspective, not laboratory perspective.

Those in the roster need to be capable of being mobilized for no more than 10 days at a time to another country or territory."

Interested parties are requested to respond to CWWA's Secretary the e-mail above, copied to Ana Treasure at [treasurea@paho.org](mailto:treasurea@paho.org) with CV's attached.

# A CASE STUDY: Results of Ultrafiltration Compared to Conventional Pre-Treatment

BY: MANUEL GARICA DE LA MATA, Unitek  
VICTORIA VASINI, Unitek

Best Paper  
2012 CaribDA Conference

Pre-treatment is a key factor in reverse osmosis desalination plants (SWRO). It directly affects operational costs, plant reliability and availability. According to recent studies, 51% of membrane failure occurs due to deficient pre-treatment, 12% due to bad coagulant dose at conventional treatments and 30% related to oxidants. In other words, 63% to 93% of RO membrane failures are related to a deficient pre-treatment.

In this paper we will discuss the results of the comparison between two different reverse osmosis (RO) pretreatments operating simultaneously in the same desalination facility: ultrafiltration (UF) and conventional pre-treatment (DAF + media filtration).

The goal of pretreatment is to provide the RO system with water quality that minimizes the frequency of chemical cleaning and replacement of membranes. To do so, it should remove all compounds that affect the normal operation of the RO membrane system, listed below:

- Suspended Solids and colloids (sand; clay; etc.)
- Organic Matter (TOC)
- Microorganisms (algae; bacteria; protozoa; etc.)
- Oil and grease
- Oxidants

## Ultrafiltration basic concepts

UF is a separation process based on size exclusion mechanism (screening). The range of separation achieved by UF is in the range of 0,01 to 0,1 microns (10 to 100 nm), allowing the separation of suspended solids, colloids, bacteria, viruses and high molecular weight species. It is a more efficient barrier also for endotoxins and other pathogens, producing high purity water with low SDI. UF doesn't remove dissolved species, salts or low molecular weight organics, but it allows partial removal of dissolved organic matter with low doses of coagulant, due to the small pore size.

UF is a filtering process that usually operates in dead-end mode: all the water that goes into the system goes out as product. The operation is semi-batch alternating filtration cycles of 30-60 min with backwash cycles that last between 45 and 60 sec. Material retained by the UF is removed during backwash, and every 8 to 24 hours of operation, typically, a chemical cleaning is performed.

The trans-membrane pressure (TMP) is 0,2 to 0,6 bar, so the cost associated to energy consumption is comparable to pressurized depth filtration systems.

A pump is required for backwash with ultrafiltrated water, as well as a chemical dosing system (typically acid, caustic soda and hypochlorite) for chemical cleaning. As pretreatment, UF only requires a coarse filter of 130 to 200 microns: typically self-cleaning filters are used. A typical process flow diagram of an UF system is presented.

## UF ADVANTAGES AS PRETREATMENT

Historically, the main disadvantage of UF as pretreatment for RO desalination was the high CAPEX compared to conventional systems. An important price reduction of UF membranes, approximately 50% in the last 10 years, is the key factor that has permitted a sustained increase in the use of UF as a pretreatment for SWRO.

### Ultrafiltration – Advantages over conventional pretreatments

- Improved treated water quality, regardless of the influent
- Allows operation of SWRO at 20-30% higher Flux
- Reduces the chemical cleaning frequency of the RO
- Extends the lifetime of RO membranes and cartridge microfilters
- Lower footprint
- Higher automation
- Lower chemical requirement (ie. coagulants, anti-foulants)
- Lower TCO (Total Cost of Ownership)

(Continued on page 3)

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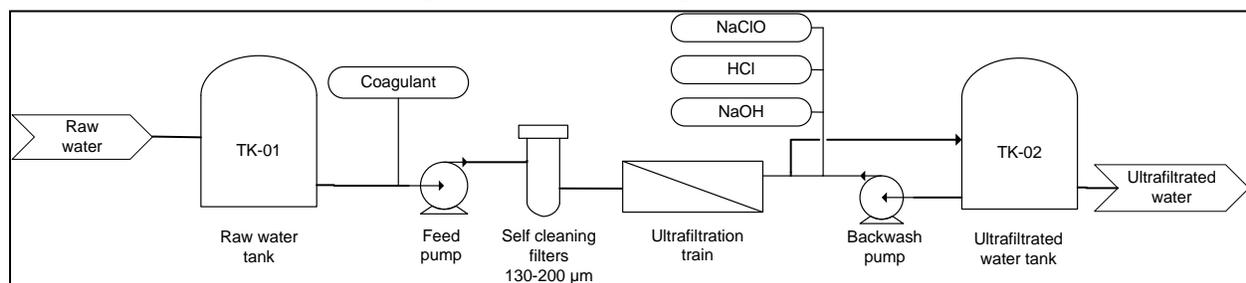
(Continued from page 4)

The main advantage of UF is that treated water quality does not depend on raw water quality. Since UF is a barrier, regardless of the turbidity or TSS, the ultrafiltrated water will have a turbidity lower than 0,3 NTU and a TSS lower than 0,1 ppm.

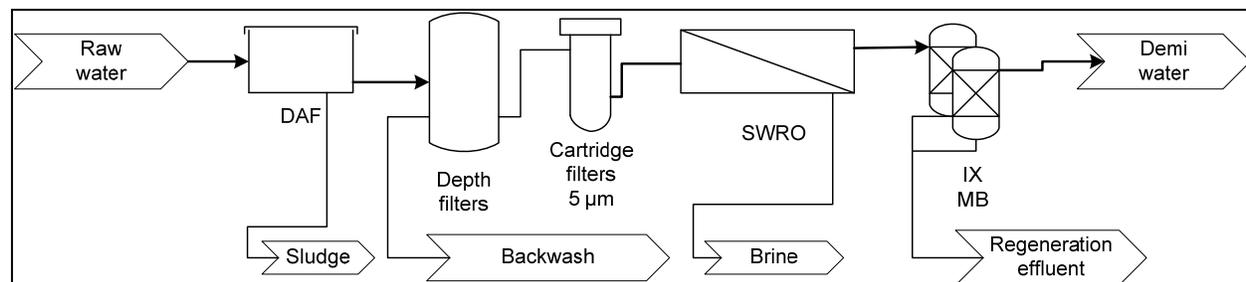
## Case study details: Ultrafiltration vs Conventional Pre-treatment

The facility analyzed in this paper, has two desalination plants. The old one with conventional pre-treatment (DAF + media filters + cartridge filters) – Figure 1 and the new one with UF (self cleaning filters + UF + cartridge filters) – Figure 2. The plant is located at sea level in the Atacama Desert in northern Chile. The product water is used for NO<sub>x</sub> removal for the power generation turbine and for boiler make-up.

**Figure 1. Conventional pre-treatment**



**Figure 2. Typical Ultrafiltration process diagram**



Both plants operated with the same source of water, therefore it is possible to compare the performance and operating costs with reliable data. The area where the facility is installed is part of a bay, where red tides often occur, and there is very low water replenishment. This creates a microbiological development (especially during the summer) that can be very high.

Due to the type of soil, it is not possible to perform beach wells, so the only viable option is open intake, which was already made at the moment of installation of the new plant.

The new plant, installed in 2010, produces 110 m<sup>3</sup>/hr (0,7 MGD), includes three units of Ultrafiltration capable of treating 300 m<sup>3</sup>/hr (1,9 MGD) of sea water, followed by two steps of RO: a first step of SWRO, and a second of Brackish water RO. Finally, permeate water is polished by CEDI producing 110 m<sup>3</sup>/hr (0,7 MGD) of DEMI water with less than 0,1 microS/cm. Overall recovery of the system is 40%.

(Continued on page 4)

Your feedback is very important for improving the organization. During and after the conference we are growing in members, we need your input so don't hesitate and feel free to be part of your organization contributing with e.g. new ideas, sending information to be publish and be part of any committee.

# A CASE STUDY: Results of Ultrafiltration Compared to Conventional Pre-Treatment

BY: MANUEL GARICA DE LA MATA, Unitek &  
VICTORIA VASINI, Unitek

Best Paper  
2012 CaribDA Conference

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**Table 1. Operational conditions**

	Plant 1	Plant 2
<b>Feed flow (sea water)</b>	~130 m <sup>3</sup> /hr (0,8 MGD)	300 m <sup>3</sup> /hr (1,9 MGD)
<b>Production (Demi wate)</b>	50 m <sup>3</sup> /hr (0,3 MGD)	110 m <sup>3</sup> /hr (0,7 MGD)
<b>Pretreatment</b>	<ul style="list-style-type: none"> <li>• DAF</li> <li>• Depth filters</li> <li>• Cartridge Microfilters</li> </ul>	<ul style="list-style-type: none"> <li>• Self cleaning filters</li> <li>• Ultrafiltration</li> <li>• Cartridge Microfilters</li> </ul>
<b>Desmineralization</b>	<ul style="list-style-type: none"> <li>• Reverse Osmosis</li> <li>• Cation and anion exchangers (IX)</li> <li>• Mixed Bed</li> </ul>	<ul style="list-style-type: none"> <li>• First step Reverse Osmosis</li> <li>• Second step Reverse Osmosis</li> <li>• Continuous Electrodeionization (CEDI)</li> </ul>

The old sea water treatment plant has a production capacity of 50m<sup>3</sup>/h (0,3MGD) of demineralized water, including the following stages: DAF, sand filter, 5-micron cartridge filter, SWRO, Cation and Anion Exchangers and Mixed Bed.

**Table 2. Operational results**

Parameter	Conventional Pretreatment Plant 1	Ultrafiltration Plant 2
Treated water SDI	No data available	100% time < 3.
Coagulant dose	25 ppm	2 ppm
Sludge handling	Treatment & Disposal dewatering)	N/A
Cartridge filter	Once/twice a month (winter) Every 4 days (summer)	Not changed yet @ 18-month operation
RO Chemical Cleaning @ 18-month operation	Once a month (winter) Once/twice a month (summer)	None yet
RO membrane replacement	12% @ 18 months 20% @ 36 months (3 years) 33% @ 48 months (4 years) 100% @ 60 months (5 years)	Not planned in the near future
Total Energy Consumption	8 – 9 KWh/ m <sup>3</sup>	5,4 KWh/ m <sup>3</sup>
Pretreatment Footprint	12x25 m 50 m <sup>3</sup> /h (0,3 MGD)	12x20 m 108 m <sup>3</sup> /h (0,7 MGD)

According to the results summarized in table 2, it can be concluded that after a significant time of operation, the pre-treatment by ultrafiltration (plant 2) has two key advantages: operating cost and availability.

The lower operating costs are due to:

- Lower coagulant requirement. This is because the pore size of the UF (0.03 um) allows the removal of material from a much smaller size compared to the conventional treatment, which consequently requires higher coagulant dose for retention of bigger flocs.
- Low cartridge microfilter replacement, due to the higher water quality obtained by ultrafiltration.

(Continued on page 5)

## A CASE STUDY: Results of Ultrafiltration Compared to Conventional Pre-Treatment

BY: MANUEL GARICA DE LA MATA, Unitek &  
VICTORIA VASINI, Unitek

Best Paper  
2012 CaribDA Conference

*(Continued from page 6)*

- No sludge disposal requirements (solid waste). The solids, removed by backwashing, are part of a liquid stream that can be returned to the sea together with the RO reject brine, without significant impact.
- RO chemical cleaning frequency is significantly lower. A new plant with UF has been in operation since May-2011 without cleaning. This allows cost savings associated to labor and chemicals, prevents deterioration of the membranes caused by the cleaning and allows a higher plant availability.
- Lower membrane replacement.
- Lower energy consumption. The energy consumption of conventional pretreatment is much higher due mainly to the DAF stage (blower), and the difference in the efficiencies of the energy recovery systems (Pelton turbine and ERI Pressure Exchanger respectively).
- Lower labor requirement. The reduced need for chemical cleaning and replacement of filter elements required, plus absence of sludge management makes the labor required for plant 2 lower than for plant 1.

The higher availability is associated with the fact that the plant requires fewer stops for membrane cleaning, replacement of filters and replacement of membranes.

To summarize, after 18 months of operation, the pre-treatment by Ultrafiltration has proved to be far superior from a viewpoint of operating cost and availability than conventional pretreatment in the case of sea water open intake in the Bay of Mejillones, Chile.

## IDA 2013 CHANNABASAPPA SCHOLARSHIP AWARD

### INTERNATIONAL DESALINATION ASSOCIATION EXTENDS APPLICATION DEADLINE FOR 2013 CHANNABASAPPA SCHOLARSHIP AWARD

**TOPSFIELD, MA, USA, May 15, 2013** – The International Desalination Association (IDA) has extended the deadline for applications for the 2013 Channabasappa Memorial Scholarship. The new deadline is June 30, 2013.

Through this program, IDA awards scholarship grants of up to \$10,000 US per calendar year to one or more graduate students who have been accepted into a program of doctoral studies and who intend to pursue a desalination and water reuse related research thesis. The objective of the program is to encourage engineers and scientists to further their education in subjects related to desalination and water reuse.

Applicants must have graduated from an accredited university and must be from the top 10% of their class in science or engineering. The applicant must prove admission to a graduate program of doctoral studies in desalination or water reuse and must exhibit leadership and achievement potential. All applicants must be IDA members.

The applications will be considered on the basis of undergraduate and graduate transcripts, references from university staff and one or more IDA members, along with the individual's motivation statement for a planned career in desalination or water reuse technologies.

IDA will announce the recipient(s) during the summer. The announcement is usually made within 60 days of the application deadline.

For more information or to download an application, please visit [www.idadesal.org](http://www.idadesal.org). For questions relating to the Scholarship Program, please contact Leslie Merrill at [lmerrill@idadesal.org](mailto:lmerrill@idadesal.org).

#### **About IDA**

The International Desalination Association ([www.idadesal.org](http://www.idadesal.org)) is a non-profit association that serves more than 2,400 core members in 60 countries and reaches an additional 4,000 affiliate members. Its membership comprises scientists, end-users, engineers, consultants and researchers from governments, corporations and academia. IDA is associated with the United Nations as part of a growing international network of non-governmental organizations (NGOs).

For detailed information and submission guidelines may be found on the IDA website [www.idadesal.org](http://www.idadesal.org) or contact Ann Seamonds at +1-978-887-9959; mobile +1-978-764-5528 or email [seamonds@seamonds.com](mailto:seamonds@seamonds.com).

## COMPANY SPOTLIGHT

BY: KARLENE SINGH, Consolidated Water Co. LTD.

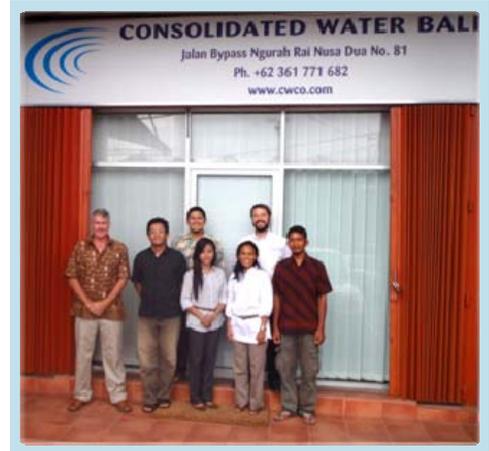
### Consolidated Water Co. LTD.

Proudly Serving Nusa Dua

Consolidated Water Co. Ltd. (CWCO), a lead player in the Caribbean Desalination Industry, has strategically expanded its business to the other side of the globe. Since 2009, CWCO has invested in establishing itself as a provider of high quality water to the Nusa Dua region in Bali, Indonesia. PT Consolidated Water Bali, CWCO's Indonesian subsidiary, was recently formed to capitalize on the growth in Bali specifically and Asia in general. The local operations team in Bali is poised to take its first strides in making safe tap water a reality.

"In Bali, Indonesia work is proceeding on the construction of the first phase of a 1.5 million gallon per day seawater desalination plant and distribution system in a rapidly-growing resort area on the island, and we expect this first phase to be operational early next year. This particular area of Bali continues to experience chronic water shortage problems while at the same time enjoying tremendous development growth. We believe this provides an excellent opportunity to use a business model that we have successfully employed in the Caribbean for almost 40 years to provide a total water solution for residents and businesses in this area of the World," concluded Mr. McTaggart in CWCO's November 2012's quarterly report.

The first phase of the 1.5 million gallon per day seawater reverse osmosis desalination plant construction is estimated to be complete by the end of April 2013.



## UPCOMING CURACAO WORKSHOP

The Caribbean Desalination Association invites you to join your colleagues and associates in promoting membrane technology in non-revenue water & plant retrofit operations. This two-day workshop will be held at the University of the Netherlands Antilles in Curacao, N.A. on June 26-28, 2013. Attendees will learn about the importance of comprehensive solutions, efficient management systems, plant retrofitting opportunities and enjoy a tour of the RO-Sta. Barbara Facility. You won't want to miss this educational opportunity.



CNN has named Curacao one of the most colorful Cities in the world!

## UPCOMING EVENTS

**June 26-28, 2013**

*"Non-Revenue Water & Plant Retrofit Workshop"*

**Curacao, Netherlands**

University of the Netherlands Antilles

**June 24-27, 2014**

*2014 Biennial Conference & Exposition*

*"Drought-Proofing the Caribbean"*

**St. Thomas, U.S. Virgin Islands**

Marriott Frenchman's Reef & Morning Star

Please visit our event calendar online for more information at [www.caribda.com](http://www.caribda.com)

## MEMBER SPOTLIGHT

BY: BILL ANDERSON, Energy Recovery, Inc.



**Matthew Laguitton** [m.laguitton@gmail.com](mailto:m.laguitton@gmail.com)

Most of you do not know Matthew as he has been working in Australia for the past few years. He has always planned to settle in the Caribbean so he became a member of CaribDA in 2010. Matthew has extensive experience in municipal water works systems, WWT and SWRO plant construction and operations. He has worked in the U.K. and Australia and Speaks French, German, English and Spanish. Matthew is currently living on St. Martin. Meet Matthew at the upcoming WWT Workshop in Sint Maarten in June.

## MEMBERSHIP REPORT

BY: MARIO BENTO , M.ENG., P.ENG., Caribbean Water Treatment Ltd.

Membership renewal notices for the 2013-2014 year will be sent out in April, 2013. Members will be able to log on to the upgraded CaribDA website (see [www.caribda.com](http://www.caribda.com)) to pay their dues online. New members will be able to submit a membership application and also pay their dues online.

Username and passwords for the website members-only section were sent out to all members in February. If you did not receive this notification, you can enter your username which is your surname (first letter capitalized) followed by your capitalized initial, and then click on the "lost your password?" link. A new password will be sent to you shortly. Contact [publications@caribda.com](mailto:publications@caribda.com) if assistance is needed.

## WELCOME NEW MEMBERS!

Since Our Last Newsletter We Have Welcomed 26 New Members!

**Roderick Abinet**  
*Kemira*

**Jennifer Fehr**  
*GE Water & Process Technologies*

**Ed Paradis**  
*Grace Construction Products/deneef  
Division*

**Peter Antifave**

**Kiera Fitzgerald P.E.**  
*TSG Water Resources*

**Mickey Pocorine**

**Chris Ballard P.E.**

**Craig Hofmeister**  
*National Oilwell Varco*

**Aneliese Ramsay**  
*Trevi Systems*

**Phillip Bendix**  
*Albert-Ludwig University of Freiburg*

**David Janicki**  
*Kemira*

**Brandon Sjulín**  
*Kiewit Infrastructure Company*

**Patricia Burke**  
*International Desalination Association (IDA)*

**David Kirkwood**  
*Kiewit Infrastructure Company*

**Damone Supica P.E.**

**Gary Carmignani**  
*Trevi Systems*

**Noemi Kis**

**Matthew Thompson**  
*Water Authority-Cayman*

**Linroy Christian**

**Samuel Kramer**  
*IDE Americas, Inc.*

**Richard Waterous**  
*Kemira*

**Anthony DeFrenza**  
*Kiewit Infrastructure Company*

**Todd Lee**

*National Oilwell Varco*

**John Webley**  
*Trevi Systems*

**Charles Faulk**

**Wate Mitchell-Evans**



## CaribDA

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<b>¼ Page</b> 3.75" x 5"	\$350.00	\$550.00	\$625.00	\$700.00
<b>½ Page</b> 3.75" x 10.5" or 8" x 5"	\$600.00	\$900.00	\$1,050.00	\$1,200.00

Check Us Out On The Web!

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

## CaribDA

### Job Board Posting

Complimentary For Members And Available At A Fee For Non-Members

## Board Of Directors

### EXECUTIVE OFFICERS

<u>Member</u>	<u>Term</u>	<u>Company</u>	<u>Phone</u>	<u>Email</u>
<b>Manuel Pereira</b> (President)	2012-2014	Aqualectra Production	5999-525-0011	<a href="mailto:mpereira@aqualectra.com">mpereira@aqualectra.com</a>
<b>Shawn Meyer-Steele</b> (Vice President)	2012-2014	H2OProfessionals LLC	305-859-2329	<a href="mailto:smsteele@h2oprofessionals.com">smsteele@h2oprofessionals.com</a>
<b>Gerard Pereira</b> (Treasurer)	2012-2014	Consolidated Water Co. Ltd.	345-945-4277	<a href="mailto:gpereira@cwco.com">gpereira@cwco.com</a>
<b>Paul Choules</b> (Secretary)	2012-2014	Water Standard	713-400-4764	<a href="mailto:pchoules@waterstandard.com">pchoules@waterstandard.com</a>

### BOARD OF DIRECTORS

<u>Member</u>	<u>Term</u>	<u>Company</u>	<u>Phone</u>	<u>Email</u>
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