

**MANILA BAY(+ PASIG RIVER & LAGUNA LAKE)  
S.C. MANDAMUS ENVIRONMENTAL CHALLENGE**



**“ Theory & Practice in Non Bio Wastewater  
(Reuse & Recycling) Treatment Plants”,  
Part A**

**16<sup>th</sup> February 2019 ( Saturday @ 8AM)  
Venue: 3F,MPR Bldg,1044 Alhambra St.,B666,  
Ermita,Manila**

**For inquiry and confirmation of participation**

**Tel: 02 7083178 Mobile: 0945 108 6000**

**URL: [www.vgent.org](http://www.vgent.org)**



# **MANILA BAY(+ PASIG RIVER & LAGUNA LAKE) S.C. MANDAMUS ENVIRONMENTAL CHALLENGE**



## **“ Designing the Non Bio Wastewater (Reuse & Recycling) Treatment Plants”, Part B**

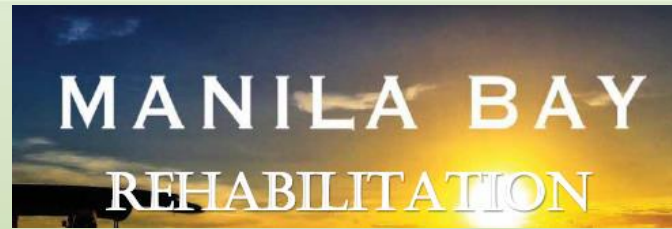
**2<sup>ND</sup> March 2019 ( Saturday @ 8AM)**

**Venue: 3F,MPR Bldg,1044 Alhambra St.,B666,  
Ermita,Manila**

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# **MANILA BAY(+ PASIG RIVER & LAGUNA LAKE) S.C. MANDAMUS ENVIRONMENTAL CHALLENGE**



## **ENVIRONMENTAL INNOVENTIVE COMPLIANCE SOLID WASTE TO ENERGY, FERTILIZER & WEALTH**

**15th February & 1<sup>st</sup> of March 2019 ( Friday @ 8AM)**

**Venue: 3F, MPR Bldg, 1044 Alhambra St., B666, Ermita, Manila**

**For inquiry and confirmation of participation**

**Tel: 02 7083178 Mobile: 0945 108 6000**

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## **PROFESSIONAL PROFILE: H. B. FREIRES:**

- *Plant Manager, 6,000m<sup>3</sup>/day R/O Plant; re-designed its processes & modified its O & M manual submitted to the Ministry Of Defense & Aviation (MODA), Al Kharj, Kingdom of Saudi Arabia ( KSA )*
- *Designed/Commissioned water treatment/ desalination systems, Reverse Osmosis (R/O) & in ARAMCO among others (East Prov., KSA)*
- *Discovered BUFFERED drinking water (KSA)*
- *Lecturer, Reverse Osmosis Plant Operations & Maintenance among Filipino Professional Mechanical Engineers & other Engineers of various nationalities (Al Khobar, KSA)*
- *Process Chemist in the pre-operational start-up of Bataan Nuclear Power Plant: designed Atomic Absorption Spectrophotometric (AAS) Analytical Procedures for NAPOCOR Environmental Monitoring (heavy metals) of the plant's marine vicinity*
- *Department Chairman & Asst. Professor, Chemical Engineering Technology Dept, Mindanao State University- Iligan Institute of Technology (MSU-IIT)*
- *B.S. Chemical Engineering graduate, Pamantasan ng Lungsod ng Maynila (PLM, 1974)*
- *Professional Regulation Commission (PRC) Reg. No. 00006375*
- *Instrumentations Engineer, Phil. Instrumentations & Controls Society (PICS); Certificate NO. 0180*

## COURSE CONTENTS

### “Operation & Maintenance of Reverse Osmosis Water & Wastewater Treatment Plants”

[1.0] Objectives: at the end of the course, the participants will be able to:

[1.1] Identify potential and/or the current cause of problem/s that beset the R/O Plant

[1.2] Decide/implement the best/most economical solution.

#### **[2.0] Course Contents:**

Time (hrs))

**[2.1] What’s a healthy drinking water?:WHO**

**0.25**

**[2.2] What’s a Reverse Osmosis (R/O) ?:**

**2.0**

[2.2.1] Concept of reverse osmosis

[2.2.2] Recovery

[2.2.3] Concentration polarization

[2.2.4] Types of membranes

[2.2.5] Types of fouculants

[2.2.6] Cleaning skid

[2.2.7] Cleaning solutions

[2.2.8] Cleaning procedures

**[2.3] What’s a typical R/O Plant Design?**

**4.0**

[2.3.1] Pre-treatment

[2.3.2] Membrane array

[2.3.3] Post-treatment

**[2.4] What’s the problem w/ your R/O Plant? What’s the solution?** 4.0

[2.4.1] Normalized salt rejection

[2.4.2] Normalized system pressure

[2.4.3] Normalized permeate flow

**[2.5] Open Forum**

**0.25**

Total

=

**8.50**



# ***PART A***

## ***“Theory & Practice in Operating a Reverse Osmosis Water & Wastewater Treatment Plant”* By Horacio B. Freires (ChE), RO Systems Designer**

### **[1.0] INTRODUCTION:**

*[CAPABILITIES, ADVANTAGES, APPLICATIONS, EQUIVALENT TECH]*

### **[2.0] THEORY**

*[DIFFUSION, OSMOSIS, OSMOTIC PRESSURE, REVERSE OSMOSIS, CONCENTRATION POLARIZATION, RECOVERY, SALT REJECTION, DRIVING FORCE RECOVERY, SALT BALANCE]*

### **[3.0] TYPES OF R/O MEMBRANES**

*[SPIRAL WOUND, HOLLOW FIBER, CELLULOSE ACETATE, POLYAMIDE]*

### **[4.0] TYPICAL R/O PLANT DESIGN**

*[PRE-TREATMENT, MEMBRANE ARRAY, POST-TREATMENT, SCHY-TECH OPERATIONAL SEQUENCE, INSTRUMENTATIONS]*

### **[5.0] OPERATION & MAINTENANCE**

*[PREVENTIVE PLANT OPERATIONS MONITORING. NORMALIZATION GRAPHING: SALT REJECTION, PERMEATE FLOW, DIFFERENTIAL PRESSURE; FOULANTS, TROUBLE-SHOOTING, MEMBRANE CLEANING]*

• **“Designing a Reverse Osmosis Water Treatment Plant” PART B**

**[1.0] INTRODUCTION:**

**[PLANT CAPACITY, RAW WATER CHEMISTRY, RECOVERY, APPLICATION, PRODUCT WATER QUALITY]**

**[2.0] MEMBRANE ARRAY**

**[MEMBRANE SIZE, TOTAL NO. OF MEMBRANES, NO. OF MEMBRANE PER VESSEL, STAGING, OPTIMUM PLANT RECOVERY]**

**[3.0] SIZING OF PUMPS**

**[HIGH PRESSURE AND BOOSTER PUMPS]**

**[4.0] SIZING OF FILTRATION UNITS**

**[SOFTENER, MICRON, SAND (BED), ACTIVATED CARBON, (BED), ETC.]**

**[5.0] DOSING SYSTEMS**

**[ANTI-SCALENT, CHLORINATION, DE-CHLORINATION, PH-ADJUSTMENTS ETC.]**

**[6.0] SCHEDULING SEQUENCE OF OPERATIONS:**

**[START-UP / SHUTDOWN PROCEDURES, LEVEL-CONTROLS, PRESSURE CONTROLS, INSTRUMENTATIONS]**

**[7.0] PLANT & INSTRUMENTATION DIAGRAM**

**[STANDARD EQUIPMENT SYMBOLS, DRAWING]**

**[8.0] ELECTRICAL CONTROL DIAGRAM**

**[STANDARD ELECTRICAL SYMBOLS, DRAWING,]**

**[9.0] PLANT EQUIPMENT LAY-OUT**

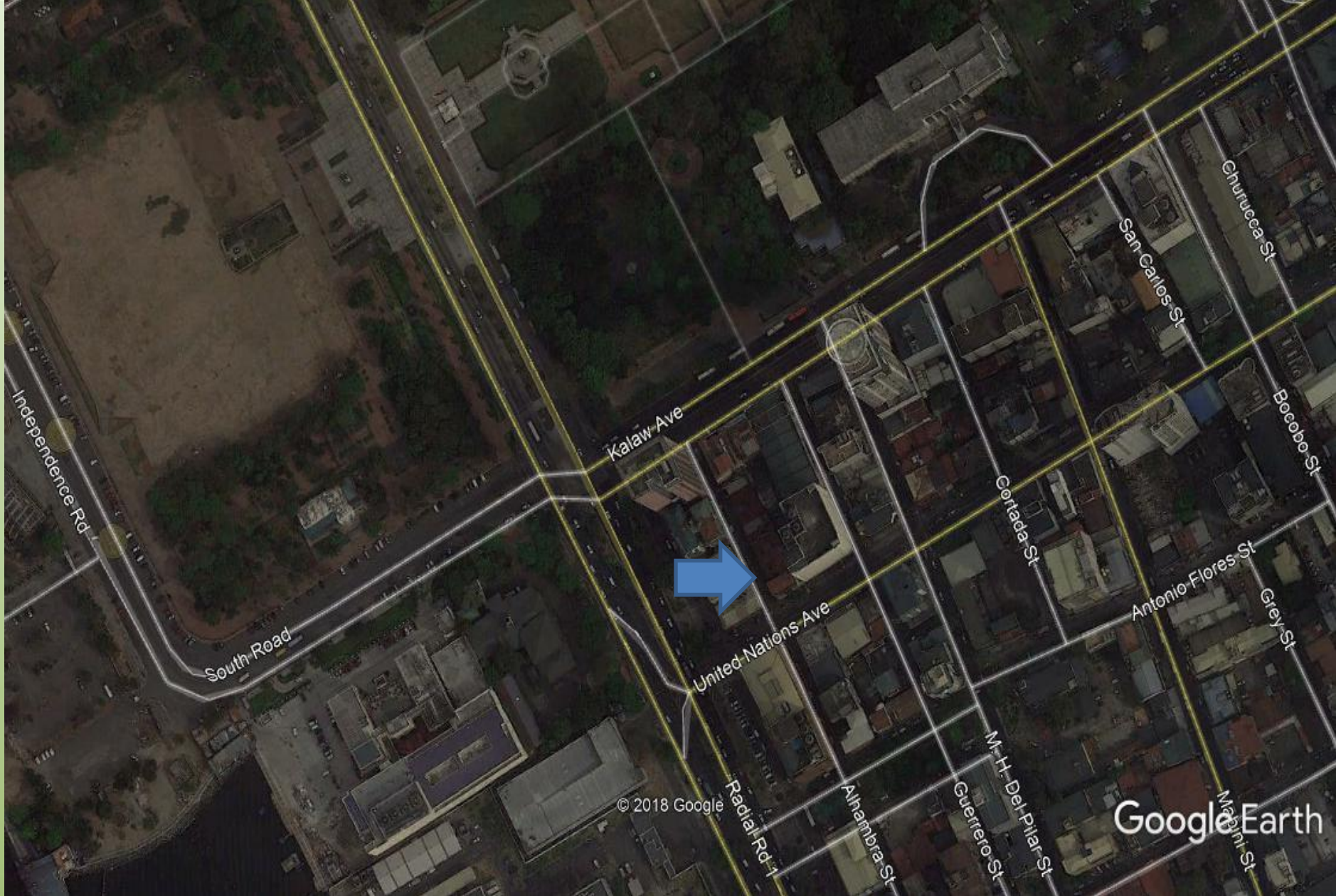
**[SITE MEASUREMENT, DRAWING]**

**[10.0] MECHANICAL SKID**

**[MEASUREMENT, DRAWING]**

**[11.0] HYDRAULIC CONTROL PANEL**

**[MEASUREMENT, DRAWING]**



## LOCATION OF VGENT FOUNDATION TRAINING SERIES