

## ENG. MOHAMAD AMIN SAAD

### SUMMARY OF MAJOR RO PLANTS & PROJECTS

#### *Summary of Plant Experience*

Engineer Mohamad Amin Saad has 38 years of extensive technical and business experience in water desalination, most of which was gained and practiced at some of the world's largest and most strategic RO plants, especially those located in the Sultanate of Oman, the United Arab Emirates, the Kingdom of Saudi Arabia, the Kingdom of Bahrain and the State of Kuwait. His recognized industry contributions stemming from extensive, hands-on involvement (*system design, start-up/commissioning assistance, operation & performance evaluation and monitoring, trouble-shooting and optimization & upgrade*) in over 50 major seawater and brackish RO and UF membrane plants.

Eng. Saad's consulting and plant services experiences include investigating, identification, characterization and implementing effective strategies and techniques to minimize or prevent the onset of membrane system organic, inorganic, biological and colloidal fouling and chemical scaling problems at tens of major brackish and seawater RO plants around the world, mostly located in the Middle East/Arabian Gulf, Europe and the USA since 1983.

#### *The following 15 major plant cases are examples:*

1. On-going technical consulting and desalination advisory services to three groups of a multi-national management consulting conglomerate operating in KSA and UAE. Clients of the three groups include the NEOM Project, a 500-billion US Dollar greenfield infrastructure project on the West Coast of KSA, the Privatization Transformation efforts of the Saudi Arabian Saline Water Conversion Corporation (SWCC), and Bahrain's Electricity & Water Authority (EWA) Transformation Program.
2. Technical auditing of one of the largest SWRO plants in the GCC Region in order to verify and validate massive multi-national insurance claims based on multiple system failures at the plant by the EPC.

3. Consulting and plant services under an annual contract with a major independent water and power project developer and supplier to restore the performance and operational efficiency and resolve the organic fouling issues of a 37.5 MIGD SWRO plant in the UAE, as well as technical and contractual oversight of an adjacent 30 MIGD Expansion which just started commercial operation.
4. 16-month secondment as Technical/Engineering Director & Commissioning Manager with ACWA Power Barka, Oman, an API project company (Sept. 2012 – Dec. 2013) responsible for providing all engineering, evaluation, testing and commissioning support for a new SWRO plant constructed as an expansion of an existing IWPP Plant (UF/SWRO; 45,500 m<sup>3</sup>/day; 10 MIGD). His responsibilities included heavy technical and contractual oversight and monitoring of the project's EPC system design, construction, procurement and UF & RO systems control optimization, acceptance testing activities (factory and site) and progress schedule to assure full compliance with all agreed specs (Minimum Functional Specifications – MFS), best engineering practice and other parameters and restrictions. He also acted as liaison with Oman's Public Authority of Electricity and Water (PAEW) during the project's bidding and design phase, and Oman Power and Water Procurement Co. (OPWP) as well as its supervising Engineer on site (Mott McDonald) during the plant's construction and commissioning phases. **The project was successfully completed in record 17 months.**
5. 32-month full-time secondment as Operations Manager with BOWAREGE, an ACWA Power International project company (Jeddah, Jan. 2010 – Aug. 2012) responsible for investigating, troubleshooting and resolving the severe organic fouling and massive failures of membrane performance and availability due to very poor feed water intake location and water quality, as well as optimizing, upgrading BOWAREGE IWP UF/RO Desalination Plants (2 X 25,000 m<sup>3</sup>/day; 2 X 5.5 MIDG), the first and only large mobile desalination plants in the Kingdom and the world, in operation since 2008 at Shuaibah, Shuqaiq and Yanbu. **The results of his contractual and technical oversight and upgrade work included restoring and maintaining the operational efficiency and availability of the twin plants from less than 20% to over 90%, resulting in doubling the net project company revenues and bringing the project into full profitability from near bankruptcy.** The parent company's Chairman stated in a documented Board meeting that "*what was accomplished should be taught in Harvard Business School as a model of how to come out of a dire situation*". Due to this success, the project was later selected as the recipient of the prestigious 2011 Saudi Water and Power Forum's Award for Innovation.

6. Assessing and evaluating (*as an in-house Expert Witness*) the pre-treatment system design and operational deficiencies at Shuaibah IWPP Expansion RO Plant (150,000 m<sup>3</sup>/day; 33 MIGD), the first IWPP RO plant in KSA in operation since 2009 and serving the Makkah Region.
7. Assessing and evaluating the membrane and pretreatment performance and operational issues at Shuqaiq IWPP RO Plant (230,000 m<sup>3</sup>/day, 50.6 MIGD), KSA, in operation since 2010 and serving the Madinah & Taif Regions.
8. Troubleshooting and resolving the severe organic fouling issues at Buraidah Municipal UF/RO Plant (160,000 m<sup>3</sup>/day; 35.2 MIGD), one of the largest operational brackish water RO plants of its kind worldwide in operation since 2008.
9. Troubleshooting and resolving the organic fouling issues affecting the Toray spiral-wound but not the DuPont hollow-fine fiber membrane trains at Al-Jubail SWRO Plant (90,909 m<sup>3</sup>/day; 20 MIGD), in operation since 2000 as the largest seawater RO plant in the world at the time. The issues were resolved by identifying the main source of fouling (cationic polyelectrolyte) and stopping it, which resulted in baseline restoration of design and operational performance parameters.
10. Evaluating the 15-year operational efficiency and performance, as well as advise on upgrade requirements of the 6 Riyadh Water & Sewerage Dept. Desalination Plants (Salboukh, Manfouha I & II, Buwaib, Malaz & Shmeisi), the first large commercial RO plants in the KSA and the world totaling 206,000 m<sup>3</sup>/day (45.32 MIGD ) in capacity and in operation since 1984.
11. Addressing the potential for biological fouling at UAE's remote Area RO Plants in UAE (total 8), including:
  - a) Sir Baniyas SWRO Plant
  - b) Dalma SWRO Plant
  - c) Abu Al-Abyadh SWRO Plant
  - d) Mirfa SWRO Plant
  - e) UAE Army RO Plants.

Provisions for shock chlorination (replacing continuous chlorination as the standard disinfection method) and relocation of the dechlorination dosing point to downstream of the micron filters (instead of upstream) resulted in preventing the incidence of biofouling at these pioneer plants for several years of operation despite the deficient intake and pretreatment system design.

12. Investigating, troubleshooting and resolving the biological fouling issues at Ras Abu Jarjur RO Plant (56,000 m<sup>3</sup>/day; 12.32 MIGD), in operation since 1984 in Bahrain.
13. Investigating, troubleshooting and resolving the biological fouling issues of the Saudi ARAMCO seawater RO desalination plants at Tanajib (10,000 m<sup>3</sup>/day; 2.2 MIGD) and at Safaniya (17,000 m<sup>3</sup>/day; 3.75 MIGD).
14. Investigating, troubleshooting and resolving the biological fouling issues at Al-Birk RO Plant (1,000 m<sup>3</sup>/day; 220 KIGD), the first SWRO plant in the KSA and GCC Region, in operation since 1983.
15. Investigating, troubleshooting and resolving the membrane water hammer issues at Ghar Lapsi RO Plant (21,000 m<sup>3</sup>/day; 4.62 MIGD), the first large commercial seawater RO plant in the world in operation since 1983 in Malta.

***Projects Worked on as Director of Technical Marketing, Decision Investments, Inc.,  
Biosphere 2® Project***

1. Design and implementation of once-through treatment system for remediation and discharge of one million gallons of highly-contaminated wastewater in accordance with federal and state environmental regulations.
2. At his own initiative, Eng. Saad successfully led a team in designing, coordinating and implementing a comprehensive environmental waste management and regulatory plan site-wide at the Biosphere 2 project in Arizona. The plan included the system included a filtration system and an RO membrane system to remove contaminants and heavy metals to acceptable levels for discharge.
3. Evaluation, upgrade and monitoring of Biosphere2® internal and site water systems.
4. The potable water system, part of the enclosed water cycle inside the Biosphere, was completely redesigned and refurbished, achieving reliable and safe water supplies for internal potable use. The upgrade included re-commissioning of the moth-balled ultraviolet disinfection system and removal of toxic contaminants from the product water.
5. Evaluation, trouble-shooting, upgrading, optimizing Biosphere2® critical CO<sub>2</sub> abatement chemical system, as well as designing and implementing the site's environmental waste management compliance plans.

6. The system redesign resulted in achieving a 50% improvement in overall system efficiency while reducing the levels of CO<sub>2</sub> inside the Biosphere to unprecedented levels, allowing the shutdown of the chemical system one month earlier than usual in the previous 3 years. Other tangible results included improving the safety records of personnel involved in the operation of the chemical system.

***Projects & Proposal and Plants Worked on as Development Manager,  
Membranes (Aqua-Chem)***

1. Process design, startup & commissioning, operation/performance monitoring and optimization of industrial wastewater treatment system as part of Zero-Liquid Discharge compliance project.

Client: Alcoa Aluminum  
Locations: Messina, New York, United States  
Dates: June 1991- October 1992  
Plant: Power Plant  
Size: 2,750 m<sup>3</sup>/day (RO system)

2. Eng. Saad was the chief developer and designer of the pretreatment and membrane systems implemented for Alcoa in upstate New York. The RO system was combined with a multi-effect thermal desalination system (MED) to treat Alcoa's cooling tower blow down effluent at its ZLD facility at a power plant. The hybrid treatment system replaced an aging thermal desalination unit, and improved the cost-effectiveness of the treatment process by about 40%.

3. Plant System/Process Design, Startup & Commissioning, Operation/Performance Optimization, Trouble-shooting and Technical Proposal (including P&ID) & Business Development and Marketing

Clients: Power generation, petrochemical and industrial process plants, membrane manufactures, OEMs, consultants, municipal authorities, industries. Internal pilot plant design, operation, performance evaluation and testing of new open-channel membrane technology.

Locations: United States, South America, Middle East

Dates: April 1991- November 1992

Plants: Municipal (brackish), potable (brackish and seawater) and industrial wastewater RO plants, including those with zero-liquid discharge applications with extensive pretreatment requirements.

Size: 500-40,000 m<sup>3</sup>/day.