O&M Optimization and Customer Requirements

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SAWACO Water-Desalination

- SAWACO -Water Desalination is the leading and among the first private supplier of un-bottled potable water in K.S.A. License granted in 1999.
- SAWACO operates and maintains its own and third party desalination plants and water transportation fleets.
- Current production capacity exceeds 32,000 m^3 /day
- It operates it own 100+ SS tanker fleet carrying water to customers spread over a 10,000 km^2 area in the Western Region of Saudi Arabia.
- New contract concluded for supplying water to ARAMCO sites from from Najran (Yemeni Border) to Tabuk (Jordanian Border)

SAWACO Water-Desalination

- Saudi Brother Commercial Group is the parent company of SAWACO.
- SAWACO celebrated its 10th anniversary on December 23, 2011.
- SAWACO- Water Desalination developed 3 SWRO plants :
  - North Obhor
  - CROP
  - SoJeCo

The Need for a New Approach

- SAWACO started its business when water was scarce in Jeddah.
- Recently, Government water supplies improved drastically with NWC
- Industrial Clients held the key for survival
- The answer was in designing water for different industrial needs
- Something government extensive /complicated networks cannot possibly achieve
- Hence the concept “Designer Water” was created
- This concept can be applied when industrial clients are clustered anywhere in the world
- This is a concept that is infrastructure-resistant and water abundance-resistant!!

“Designer Water” Concept

- Many industries need different types of water for their processes
- In-house pre-treatment is costly, needs valuable space and adds to opex and requires specialist knowledge
- SAWACO has its own fleet of SS tankers
- O&M capabilities + Good analytical skills + expertize in water treatment = customization of water
- That was the beginning of the “Designer Water “concept
- Industrial users are open to outsource water treatment in order to focus on their core business
- All of a sudden, water tankers turned from a symbol of backward infrastructure into an appealing solution for the most sophisticated industries!!

O&M Capabilities: first ingredient

Beach Well

Ultra Filtration

Raw Tank

Feed Tank

Cartridge Filters

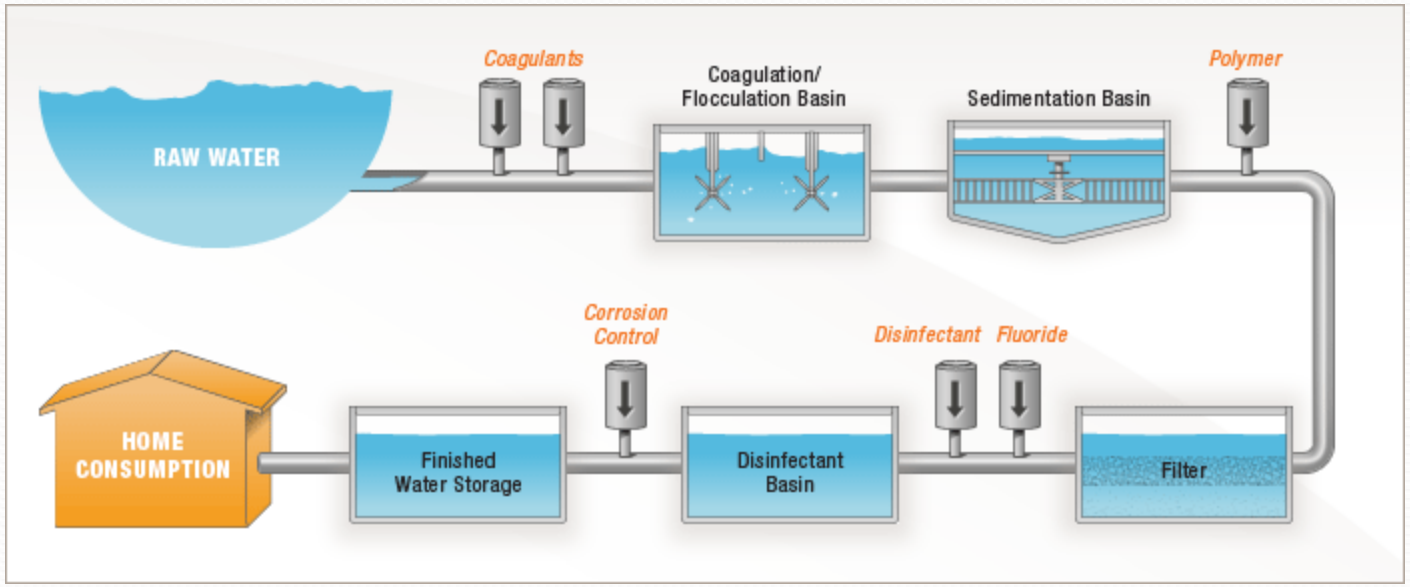
High Pressure Pumps

Reverse Osmosis

Product Tank

Good Labs Facilities : second ingredient

Expertize In Water Treatment : third ingredient



“Designer Water” : designs to suit all applications !

SAWACO Produces 10 different types of Water

Water Type	TDS Value in ppm	PH
Type I	280<TDS<350	7.0 <pH<7.8
Type II	200<TDS<250	6.8<pH<7.5
Type III	150<TDS<200	6.5<pH<7.5
Type IV	100<TDS<150	6.3<pH<7.5
Type V	50<TDS<100	6.3<pH<7.2
Type VI	25<TDS<50	6.0 <pH<7.2
Type VII	TDS<10	6.0 <pH<6.5
Type VIII	280<TDS<350	Zero Chlorine
Type IX	280<TDS<350	8.0 <pH<9.2
Type X	280<TDS<350	High Chlorine - 1 ppm

“Designer Water” : new designs keep rolling out..

SAWACO has launched in March 2012 Type XI: Low Boron Potable water :

- 0.3PPM < BORON < 0.7 PPM
- 7.5<pH< 9.5
- TDS< 90ppm

Three new types of water are under development that cater for different industries .

Building Business Around Customers

- SAWACO tailors its water as per individual customer requirement
- Some customers want water free from chlorine
- Others may want water with low TDS (total dissolved solids) for boilers etc.
- Some industries look for high pH, others for Chlorine free water
- Things can get tricky : high alkalinity but pH not exceeding 7.5

PEPSI COLA

- Requirement : TDS below 200ppm and chloride not more than 90 ppm
- Solution: SAWACO assigned one RO skid intended for PepsiCo them with post chemicals dosing.
- SAWACO uses a separate product tank to store water for PepsiCo

LUBEREF – ARAMCO

- Requirements: TDS below 10ppm

Makkah Water

- Requirements: Low boron content, must be below 1ppm.

Al Rajhi Steel

- Requirements: High alkalinity and low chloride.

Binzagr Co-Ro

- Requirements: Chlorine must be totally eliminated from water but bacteria free as well. Treatment by Ozone prohibited

UNILEVER

- Requirements: TDS below 15ppm with high chlorine of around 3.5ppm with a pH of 7.5

Quality Challenges

- Cannot ensure proper quality of storage facility at customers' end.

- Quality compliance from Customers labs.

Strong Points

- Water -abundance Resistant

- Infrastructure Resistant

O&M Capabilities & Privately Financed Desalination Schemes

- O&M Capabilities is key for pre-qualification criteria for Desalination BOO/BOT/BOOT schemes
- Effective and efficient O&M practices can make the difference between securing /losing a privately financed project
- O&M expertize can influence the design and choice of equipment for RO plants
- Tariff , pay-back and IRR are greatly influent by O&M regimes that determine the cost /m3 of desalinated water
- Power consumption, chemicals, manpower and spare parts can be optimized by experienced O&M operators following efficient standards
- Environmental impact of desalination plants can be substantially reduced by innovative and efficient O&M processes.

SAWACO Case Study : how the first private water utility in KSA relied on O&M for healthy growth and survival (1/2)

Two major factors were critical for growth :

- Opex was decreased over the years /m3 despite that manpower cost and material cost increased

- Flexibility and knowledge of O&M teams allowed SAWACO to produce multiple types of water with reasonable equipment, instruments and controls

SAWACO Case Study : how the first private water utility in KSA relied on O&M for healthy growth and survival (2/2)

- How was this achieved ? :
  - Adopting flat reporting structure
  - Turning Maintenance technicians into Operators and vice-versa
  - Pooling expertize from all three shifts to solve problems in any one shift
  - Maintaining enough spares
  - Adopting Predictive Maintenance
  - Immediate Troubleshooting
  - Training O&M staff to install new RO Plants
  - Developing own design capabilities from within the O&M team
  - Turning our own RO Plants into a big lab/testing premises for serious innovations
  - Simplicity in O&M processes without compromising quality
  - Adopting (without fear) new innovations in desal technology
  - Continuous training

SAWACO Case Study : Adaptation & Survival

Industrial water needs is an interesting field where RO operators can bring value added:

- ✓ Even where water is abundant , there are opportunities for RO plants
- ✓ RO operators can become partners of industries that need specific water for their production lines
- ✓ Value-added is brought by reducing pre-treatment in industrial processes
- ✓ Supplying “designer water” to the process, reduces cost and improve productivity
- ✓ This can be done by understanding the water specifications of targeted industries
- ✓ SAWACO produces different types of water : Dairy products, juices, fizzy drinks, pharmaceuticals, ready mix concrete etc.

Role of O&M in extending lifetime of desalination plants

Major cost of RO Plants are in decreasing order :

- Electricity: recovery devices/selection of HHP+ Motor/VFDs/design of intake/quality of water desired
- Labour: multi-tasking/training/motivation/flexibility of reaction & intervention
- Chemicals: the less the merrier, understanding the process need
- Parts & Maintenance: predictive approach/ample spares/proper selection of equipment/Double Checking of SCADA generated data
- Membrane : secure pre-treatment/negotiate replacement ratio & pro-rata warranty terms/understanding fouling principles: organic & inorganic
- Developing in-house capabilities to handle most maintenance tasks

- O&M cannot fix, at reasonable cost, serious errors in:
  - design
  - Choice of equipment
- Therefore, designers have to take vital input from experienced O&M specialists

Integration of QA/QC procedures into the routines of O&M

By integrating QA/QC procedures into the routines of O&M:

- a close link is created between the business & marketing plan and the customers' needs.
- decisions about the quality system are made based on recorded data and the system is regularly analyzed and evaluated for conformance and effectiveness.
- checking and pinpointing defects will become a routine like recording operating data
- continuous improvement becomes all the O&M operators business

However, this is possible when :

- suitable infrastructure, resources, information, equipment, measuring and monitoring devices are provided
- all key processes are mapped and integrated into the daily routines of the operators

Developing existing O&M procedures to adapt to new technological advances in desalination

- The basis of New-technology-adaptable O&M procedures can be summarized :
  - Establish the extent of in-house vs out-sourced O&M activities
  - Keeping the O&M team in touch/interacting with major manufacturers and innovators in this field
  - Establish periodical plans for introducing viable and tested new innovations in the Desal Equipment
  - Prepare Manpower for the functions of the new components to be introduced
  - Integrate operating data of the new equipment into existing logs/records . Develop new sets of records only if necessary
  - Replacement /introduction of new concepts to take place in a staged manner
  - Ensure seamless integration of new components into existing operation
  - In the introductory stage, maintain comparative operating data logs between existing and new technologies
  - Full conversion of all production lines to new technologies remain a Management Decision
  - Examples

Conclusion

- Building efficient O&M capabilities remain the single-most important element, post EPC, in the success of any privately-financed RO scheme
- Using O&M as an important tool in building the water production around customers' needs, Integration of QA/QC procedures into the routines of O&M, Developing and adapting O&M procedures in line with new advances in desalination technologies, are critical to the success of operating RO plants.
- Desalination cannot be considered as a stand-alone measure to meet increased water demand for public water supplies. Desalination should be considered as a viable component of an overall water supply management system that includes all available sources of water (fresh and impure) and all uses of water (public water supplies, agricultural, industrial, etc.).
- Operators have no choice but to prepare their manpower and procedures to adapt to the many new Desal innovations that are surely to become the norms in this industry.

Thank you

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