



STW Water Process & Technologies

*“A Water Solutions Company”*

OTCQB: STWS



# Processing and Zero Liquid Discharge of Seawater, Brackish Water, Flowback & Produced Water

STW/Salttech- July 2014  
Midland, Texas



# STW/Salttech Technology: DyVaR

- DyVaR applicable for all kinds of high concentrated fluids
  - Removes Total Dissolved Solids (TDS) **(DESALINATION)**
  - Removes Hardness
  - Removes TSS
  - Removes Volatiles
  - Disinfection technology
- DyVaR is a **modular system**
- DyVaR uses **no chemicals**,
- DyVaR uses **no membranes**
- *DyVaR requires **no pretreatment***
- DyVaR requires little operator attention.
- DyVaR has very high energy efficiency.
- DyVaR is **insensitive to scaling or fouling**
- DyVaR is designed for continuous operation.





# Dyvar: Markets



## General:

- High concentrated streams
- containing:
  - Fluctuating TDS levels
  - TSS (clay, sand, etc)
  - VOC

## Such as:

- Water industry
  - RO reject streams
- Oil and gas industry
  - Flowback from fracking
- Mine and metal industry
  - Mining leachate
- Process industry
  - Edging waste
  - Chemical recovery/cleaning
- Leachate/waste ponds



## Process Steps

**Step 1:** Saline water enters the DyVaR system by a feed pump.

**Step 2:** The re-circulation loop is filled with the brine to be concentrated. It is heated by the recapturing of the carried energy through means of a re-circulation pump, and heat energy is transferred via a heat exchanger.

**Step 3:** The brine is re-circulated within the DyVaR during the concentration stage. Water in the brine is evaporated within the DyVaR modules thereby continuously increasing the concentration of the carried salts as a result.

**Step 4:** The fan maintains a slight under pressure in the DyVaR unit, this will decrease the boiling point of the brine as it circulates within the DyVaR re-circulation loop. A lower boiling point creates a lower evaporation point, and also allows for a lower energy demand during the water evaporation process.

**Step 5:** The evaporated water (steam) is continuously transported by the fan to the heat exchanger. The compressor gives the steam extra energy as it is compressed.

**Step 6:** The compressed steam then passes the heat exchanger and condensates into liquid. During this condensation stage, the phenomena of exothermal energy will take place, and a huge amount of energy will be transferred via the heat exchanger back to the brine in the recirculation loop of the system.

**Step 7:** The salt concentration in the recirculation loop will increase until the desired concentration is reached (automatically measured). At that time a discharge valve is opened to release the highly concentrated brine and/or salt crystals.

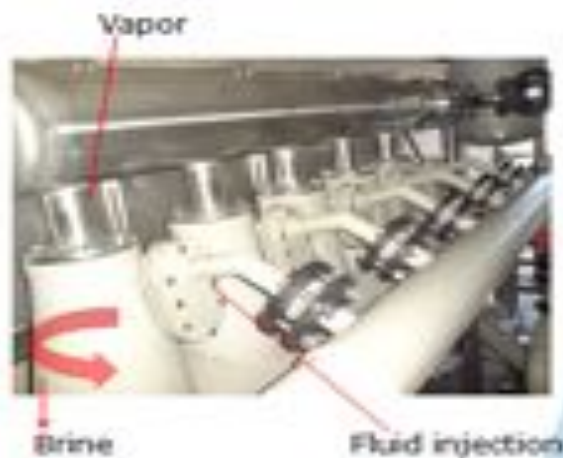
**Step 8:** The feed pump brings in new fresh brine to be concentrated, balancing the removal of concentrated brine of Step 7.

**Step 9:** A Solid Discharge Unit (SDU) is integrated within the brine discharge stream for the removal of crystals formed during the concentration process.

**Remarks:** The entire process is a continuous process. Fresh brine is supplied, and salt or concentrated brine is discharged from the system continuously. The condensate, also leaving the DyVaR unit continuously, is of demineralized-water quality.



## DyVaR: How it works



DyVaR operates at:

- Temperatures below 100C
- Pressure below 2 bar

- High speed injection
- High centrifugal force

• Inside the DyVaR unit

- **3D vapor blanket**
- Thin water film
- Vapor leaves at top
- Brine leaves at bottom

• In DyVaR system

- **No scaling**
- **No fouling**



## Crystallization

Utilizing the DyVaR system, it is possible to concentrate any saline liquid to a crystallization level. It is also possible to create a 10# Brine liquid.

## Ultra Low Scaling

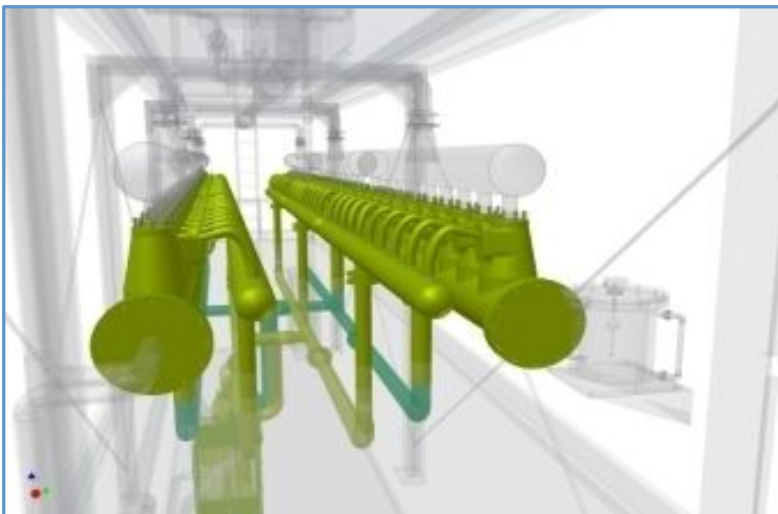
In comparison to other evaporation technologies, any scaling effects in the DyVaR system will be mitigated since boiling place in the individual DyVaR modules and not in the heat exchanger. The re-circulation rate combined with the velocity of the re-circulating liquid is so high that any formed crystal will be removed by the force of the liquid itself.

## No Chemical Use

Footprint for a 5,000 bbl/day system is approximately 40' x 80'

Zero Liquid Discharge (ZLD)- The two effluent streams are approximately 90+% fresh water and 10# Brine or salt crystals

Produced and Flowback Water- Will process up to 300,000 TDS water and reduced salt content to <200 TDS



# DyVaR: Modularity

## Modular desal system:

- 1 Dyvar unit = 50l/h = 7.5 bbl/day
- 10 DyVaR units = 1 module
- 1 module = 75 bbl/day
- Any size possible
- Any lay out possible



### Example:

- 40x30 ft footprint
- Capacity up to 3000 bbl/day
- Skid or containerized design



Influent is injected from side manifold, pure water vapor comes out the top and concentrated brine flows out the bottom.



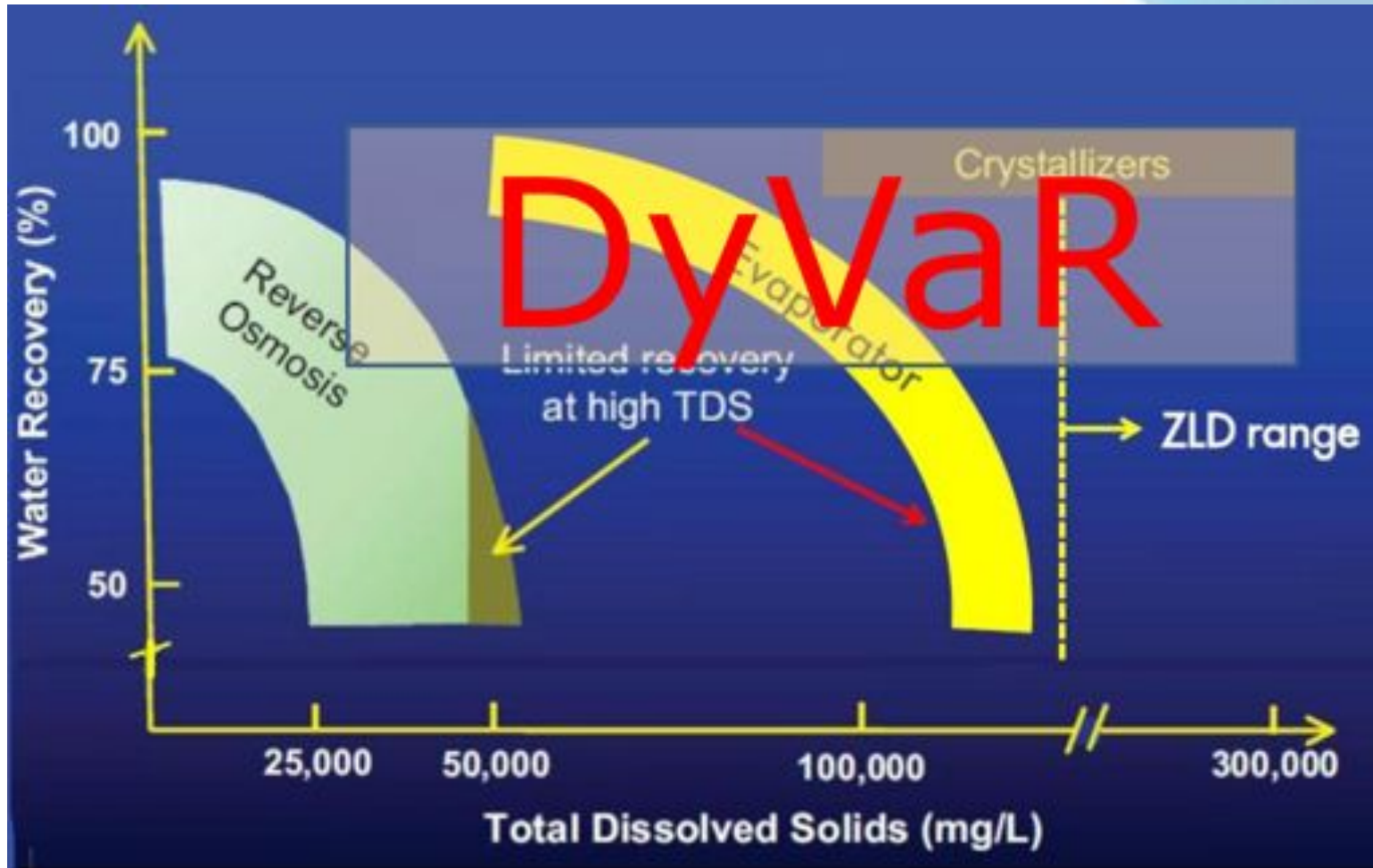
SWD Sample #1  
Influent: 134,000 TOS  
Sept 2014 Ft Stockton TX

SWD Sample #1  
Condensate: 400 TOS  
1 Sept 2014 Ft Stockton TX

SWD Sample #1  
101b Brine: 2,200,000 TOS  
1 Sept 2014 Ft Stockton TX



# Comparison of Technologies



\*basics for this diagram are based on information of Royal Dutch Shell/Shell Oil

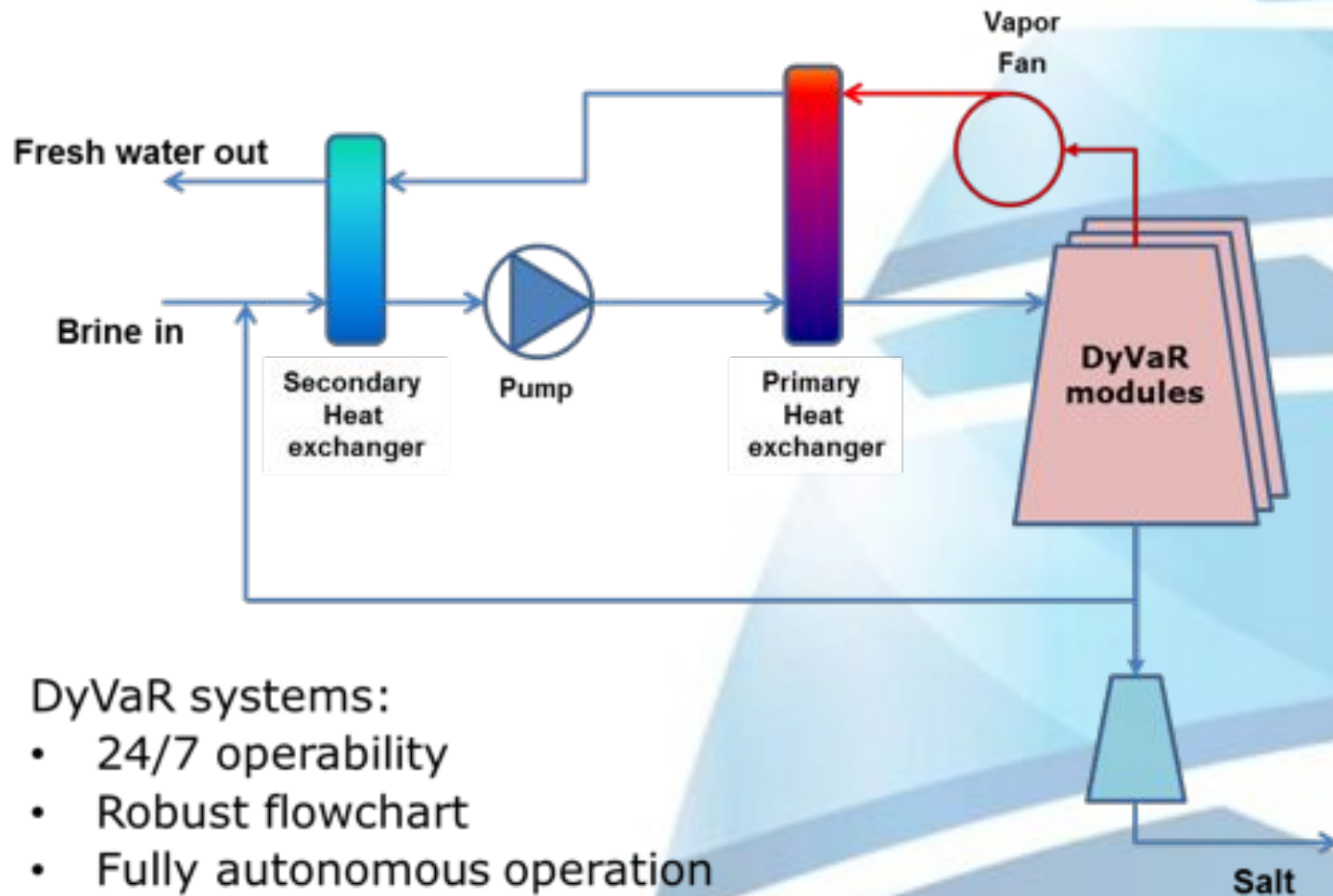
# Modular systems

Static and mobile (containerized)





# Process Flow Diagram



DyVaR systems:

- 24/7 operability
- Robust flowchart
- Fully autonomous operation
- Remote controlled

# Benefits of DyVaR Technology

- Extreme high water efficiency
- Zero Liquid Discharge
- Removal of TDS and TSS
- Production of salt crystals
- Disinfection of fluids
- Insensitive for other pollutants
- No fouling
- No scaling
- No salt concentration limitations
- Handles fluctuating TDS levels
- Inexpensive materials
- High energy efficiency
- Robust equipment
- Simple operation compared to conventional systems
- Fully automated
- 24/7 operation (minimal down time)





# ***STW Water Process & Technologies***

## ***"A Water Solutions Company"***

Subsidiary of STW Resources Holding

A

### **STW Water Company Overview:**

- STW Water is a Total Water Solutions Provider Company and provides turnkey design build solutions and provides its Customers with “out-of-the-box” design solutions to meet customer’s water needs.
- STW Water has capabilities to provide complete oversight of various water and wastewater projects with primary focus on engineering, regulatory permitting including PWS, Discharge permit, Pilot exception and Pilot Study, equipment design & treatment process design, manufacturing & installation and full scale Commissioning and training for all types of Oil & Gas, industrial and municipal water and wastewater markets throughout State of Texas.
- STW Water’s team of Professional has extensive experience in working with the various State and Local Regulatory agencies including but not limited to the Texas Water Development Board (TWDB), Texas Commission of Environmental Quality (TCEQ) and other environmental agencies in Texas and bring about safe drinking water solutions to meet the drinking water needs in Texas.
- STW Water Professionals have a long history of successfully working with Oil & Gas Companies, manufacturing companies, engineering consultants, municipalities, various state and local regulatory agencies such as TCEQ, USDA, TWDB, Army Corp of Engineers and others to assist in design, specifications, and regulatory permitting.





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## **STW Hybrid Brackish Water Processing Facility**

**30,000 barrels or 1,260,000 gallons per day**

STW Resources, in a partnership agreement with a Texas rancher will be leasing the brackish Water rights and build, own, and operate a "Hybrid Reverse Osmosis Water Processing System" Capable of processing approximately 30,000 barrels of brackish water per day on the family's ranch in Upton, County south of Midland approximately 40 miles. STW will own and operate the water systems designed by STW to process and deliver processed brackish water to oil & gas producers for use in drilling and completing wells on and around the family ranch and for use on other oil & gas fields in the area. There are in excess of 40 drillings rigs working in and around the ranch.

STW plans to build multiple STW Proprietary Hybrid Reverse Osmosis Facilities to sell processed brackish water to oil & gas producers. These projects will include access to a disposal well for any waste from the operation, ample supply of brackish water for processing, operation of the water reclamation facilities and a loading/unloading depot or extended water pipeline systems for water delivery.



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STW will process brackish water and sell it to oil and gas producers at a prevailing rate similar to the current rate they are paying for fresh water currently.

Drilling activity is expected to continue for the next ten-fifteen years.

The first facility will initially process approximately 30,000 barrels or 1,260,000 gallons of brackish water per day and deliver approximately 26,100 - 27,000 barrels or 1,096,200 - 1,134,000 gallons of fresh water per day to producers. The STW Proprietary Hybrid RO System can recover approximately **87-90.5%** of the fresh water from the Brackish water.

The capacity can be increased at any time as demand for water increases.

This a great partnership working with a local family, oil and gas producers, and extending the company's model to conserve fresh water while the development of an oil rich area continues to happen. This is a win-win deal. This project is a model for STW as our plan is to continue working with landowners to process and sell the currently unusable brackish water. It's good for everyone... the landowners conserve their fresh water and oil and gas companies are able to continue with their drilling programs while conserving our fresh water resources.



# ***STW Water Process & Technologies***

***Water Management, Water Conservation, and Water Reclamation***

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**STW currently operates in West Texas, Oklahoma, & New Mexico with expansion plans in South Texas and other areas of the North Americas and the Caribbean.**



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