Air-Driven Separation System
ADSS

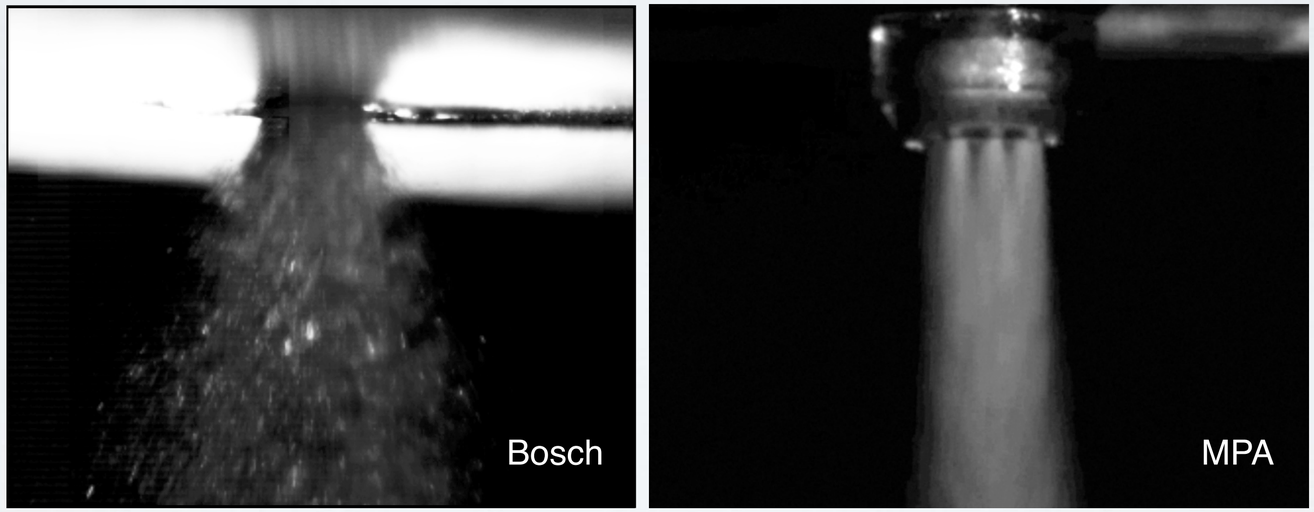
- Reduced or No Pretreatment
- Reduced Chemicals
- Substantially Reduced Energy Consumption
- Substantially Reduced Total Cost of Water
- Modular Design and Layout

July 2020 Overview

The devices and technologies set forth herein are protected by U.S. and foreign patents and patent applications pending.

V-STAX has developed a core nanogasification technology capable of reducing any liquid into specific small micron (μm) particles in a homogenized mist. Unlike other small particle technologies, high-pressures, exotic materials and complex machining are not required.

Any chemical reaction will benefit from the high surface to volume ratio that results from the small particle mists. The Company is currently working on three applications utilizing the technology.



High-speed photography clearly shows the dramatic difference in particle size and shape of plumes between a modern Bosch PFI injector and the Enginetics/V-STAX Multi Physics Atomizer (MPA).

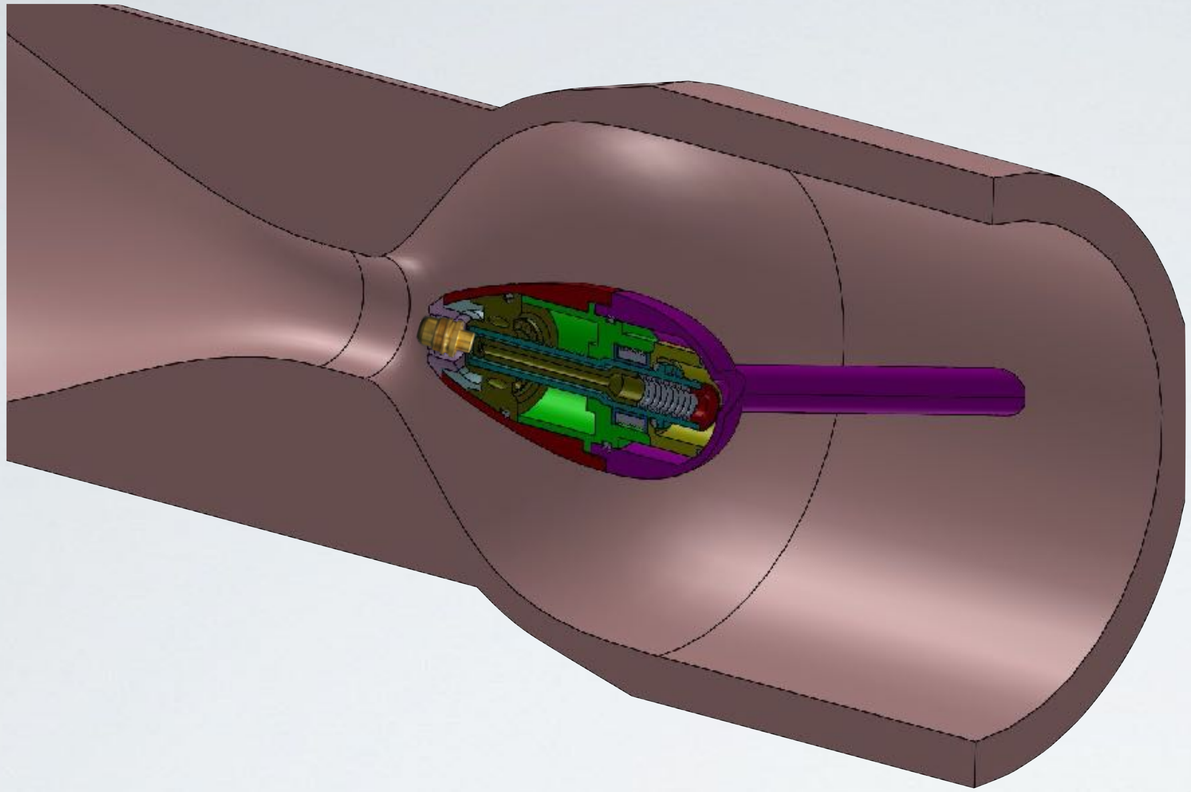
The Multi Physics Atomizer (MPA)

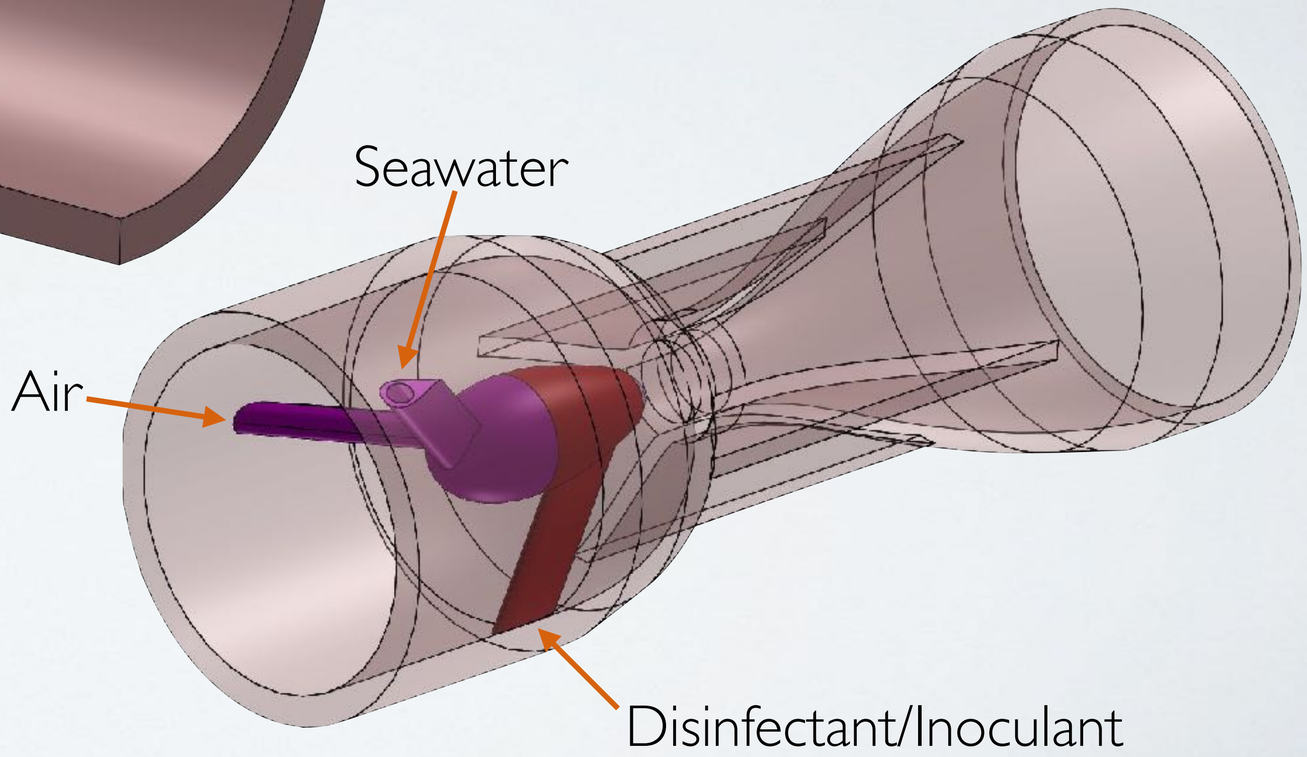
2011 — 2015

The Multi Physics Atomizer (MPA) is capable of processing a large volume of liquid into a small micron band.

This nozzle is integral to the Generation 2 Air-Driven Separation System (ADSS). It is very robust and unlike RO membranes does not require sub micron perforations. In fact, the smallest perforations in the MPA are over a thousands times greater in diameter than the largest pores in an RO membrane. And, as the ADSS is air-assisted, the MPA can be purged occasionally with a brief air-only event to prevent fouling.

Generation 2 ADSS





The Gen 2 ADSS will be powered by the MPA. The system is mechanically simpler than the Gen 1 design and capable of processing considerably more water per hour.

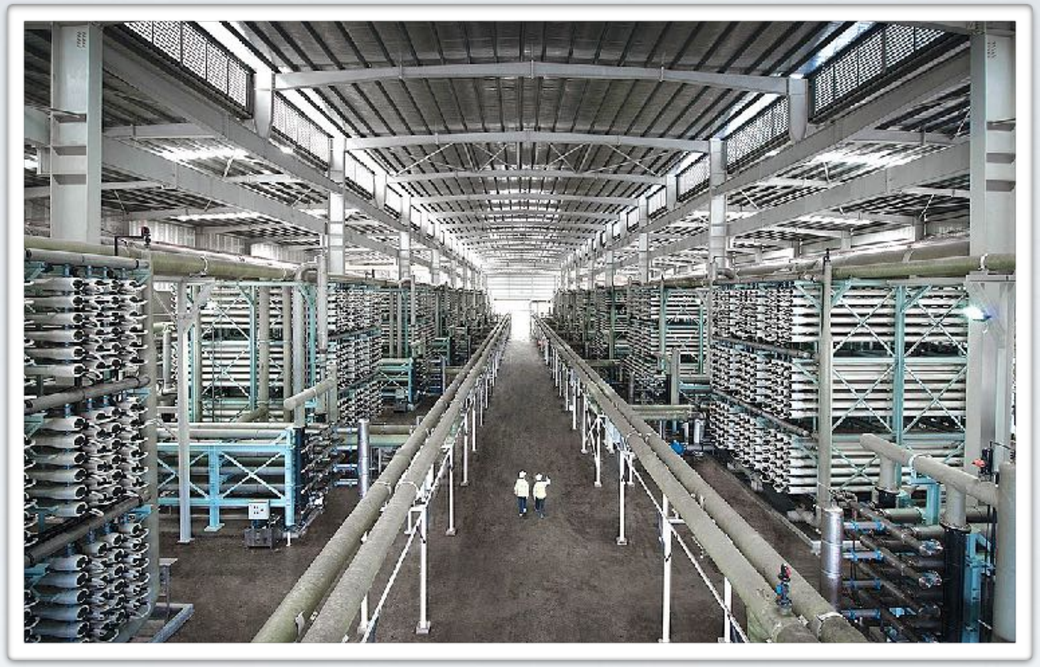
ADSS Desalination Test Results

Analyte	Item Analyzed (Analyte)	H2Origins Distillate	EPA	Cole-Parmer Baseline Fluid
1	Total Dissolved Solids	24.00	500	39000
2	Bromide	ND	2	65
3	Chloride	14.00	250	20000
4	Fluoride	ND	2	ND
5	Sulfate	2.20	250	2800
6	Boron	0.03	1	3.5
7	Calcium	1.40	75	330
8	Magnesium	0.94	30	1200
9	Potassium	0.29		390
10	Sodium	7.70	20	11000.00
11	Strontium	0.07		13
12	Alkalinity, Bicarbonate (as CaCO3)	10.00	300	150
13	pH	6.99	8.5	8.18
14	Specific Conductance	66.00		55000

The ADSS water test results are shown along side the published limits by the EPA. **The ADSS exceeds the water purity standards in every category**.

Of particular note is Boron, a very difficult mineral to extract from water. The ADSS was able to reduce the level of Boron from 3.5 mg/L to 0.03 mg/L.

Desalination



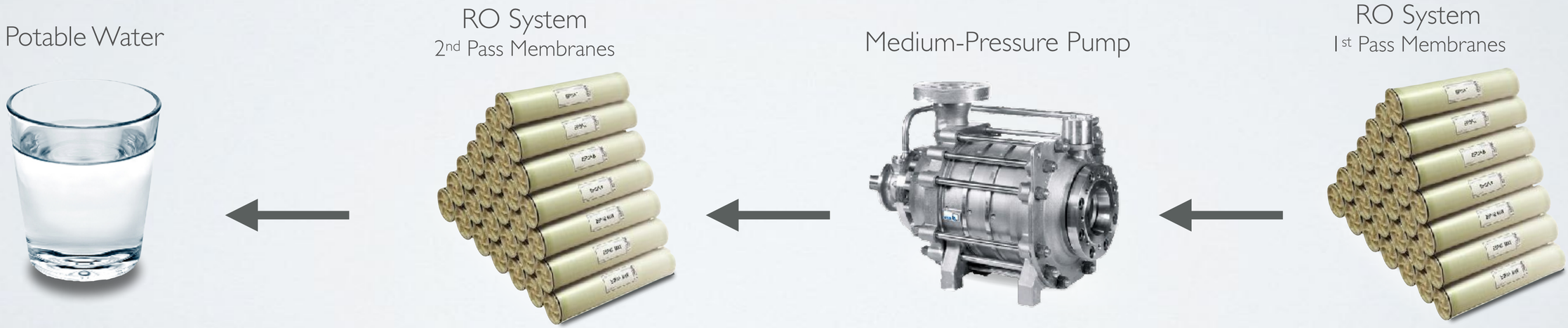
RO
Reverse Osmosis

MED

MSF Thermal

Legacy SWRO Process

With the exception of chlorine, the chemicals used to dose seawater facilitate membrane longevity. They do not aid in removing salt. While two stages of membranes comprised of sub-micron pores are utilized to desalinate the seawater, another membrane-based technology with small-micron pores is often used in the pre-filtration process. Powering the high-pressure pumps represents the largest recurring cost in an SWRO plant.



A basic schematic illustration of an SWRO plant layout

H2Origins®/SWRO Hybrid Process

INTAKE

Reduced Chemical Dosing

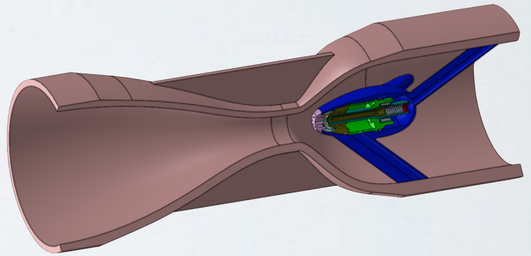
Reduced Media Filtration

Air Compressor

Low-Pressure Pump

The ADSS doesn't have to displace SWRO altogether. In fact, the two technologies can work in tandem. RO membranes have a 40 year track record of effectively removing salt from seawater. They can quickly and irreversibly foul if the feed water is not properly pretreated and filtered to remove almost all other solids, however. The ADSS could replace the membrane based pre-filtration system. In addition, the media filtration and chemical dosing requirements would be decreased. As the ADSS will remove the majority of TDS and salt, only one low-pressure desalination membrane stage may be required. The end result would be a lower CAPEX and significantly reduced daily operating costs.

Gen 2 ADSS



Low-Pressure Pump

RO System Membranes

Potable Water

A basic schematic illustration of a Hybrid plant layout

Wastewater Management

WR3® WASTEWATER Reprocess Recover Reuse

Fracking

Advancements in hydraulic fracturing ("fracking") have allowed US energy companies to access natural gas and oil trapped in shale. Production from this sector is the main reason the US is now an energy exporter. While the technologies associated with extraction have evolved over the years the methods for water treatment have remained the same. And with environmental regulations getting stricter, new options will be required. The ADSS will provide a robust solution for managing wastewater heavily ladened with chemicals, oil and sand.

Brackish

Salinity as well as the quantity and composition of minerals found in brackish water varies greatly depending on location. No one solution can process brackish water from all sources. Once again the ADSS could become the core of a singular solution capable of removing these solids and producing water suitable for agricultural use.

A robust industrial water recycling system has a vast market outside of the fracking industry.

- There are over 1.7 Million active oil and gas wells in the US.
- Each wellhead requires 3,785 m^3 of fresh water for fracking and will discharge up to 378 m^3 of wastewater daily.
- In 2018, 3.32 Billion m^3 of produced water were extracted in the US.
- Water demand for the US shale gas industry in 2018 was 779 million m^3.

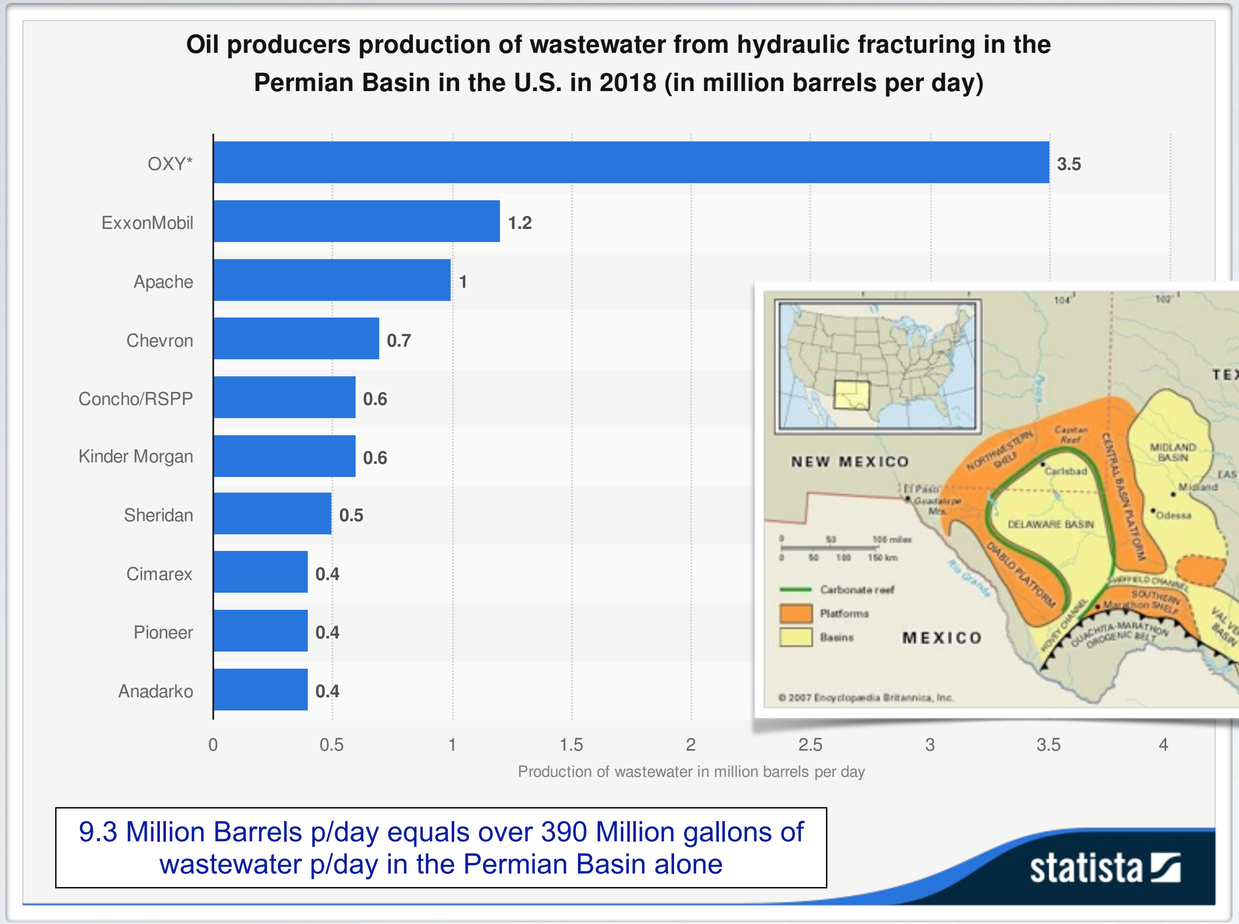
As large as these numbers seem, the water used in fracking accounts for less than 1% of the total industrial water use in the U.S.A.

U.S. Shale Gas Industry

Annual Market for Wastewater Treatment
$12 Billion

Annual Market for Wastewater Transportation
$10 Billion

The U.S. shale gas industry spends billions of dollars a year treating wastewater. In addition, billions more are spent to transport the wastewater between the fracking sites and water treatment facilities. The ADSS can form the foundation of an efficient industrial wastewater treatment system less prone to fowling than current alternatives. And, as the technology is modular, systems can be scaled for treatment on-site to reduce the number of barrels of waste that must be transported.



For every barrel of oil extracted through fracking, 8-10 barrels of water are produced. The water contains various quantities of fracking fluids, oil, heavy metals, chloride and possibly radioactive compounds. Produced water is not suitable even for reuse without treatment. Currently, gas and oil companies treat only a small portion of produced water for reuse. The rest is disposed of in static ponds or through deep well injection. However, the transportation costs alone to haul the wastewater to a disposal site in the U.S. range from $3 to $7 per barrel. This translates to between $10-$12 billion a year.

The ADSS would be most effective as a core technology in an integrated on-site treatment system for produced water. As the ADSS is not a small-pore technology like RO or graphene, fluids with high concentrations of TDS can be processed without fouling. In addition, the flow of produced water can be interrupted for a few tenths of a second, allowing for periodic air purges to keep the system deposit-free.

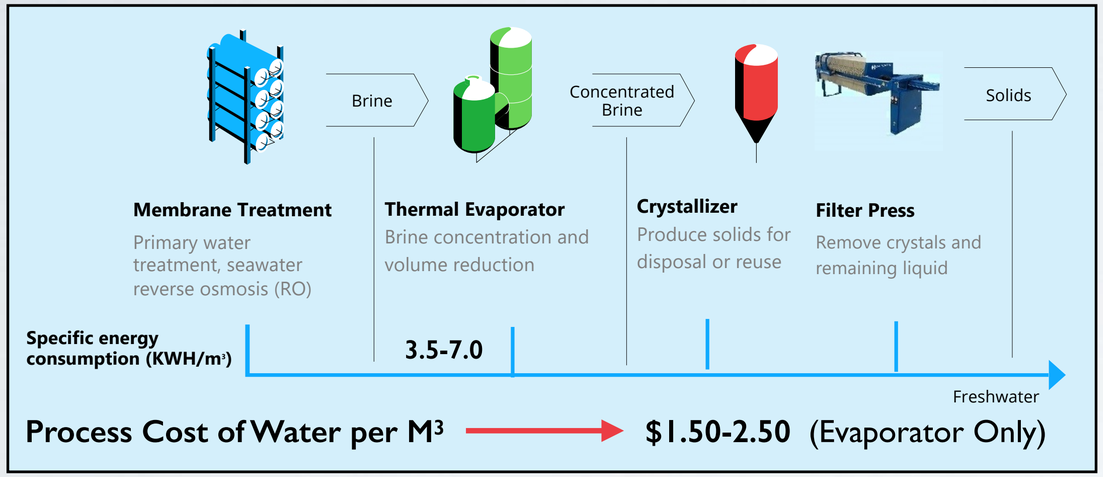
ZLD™

WR3® Zero Liquid Discharge

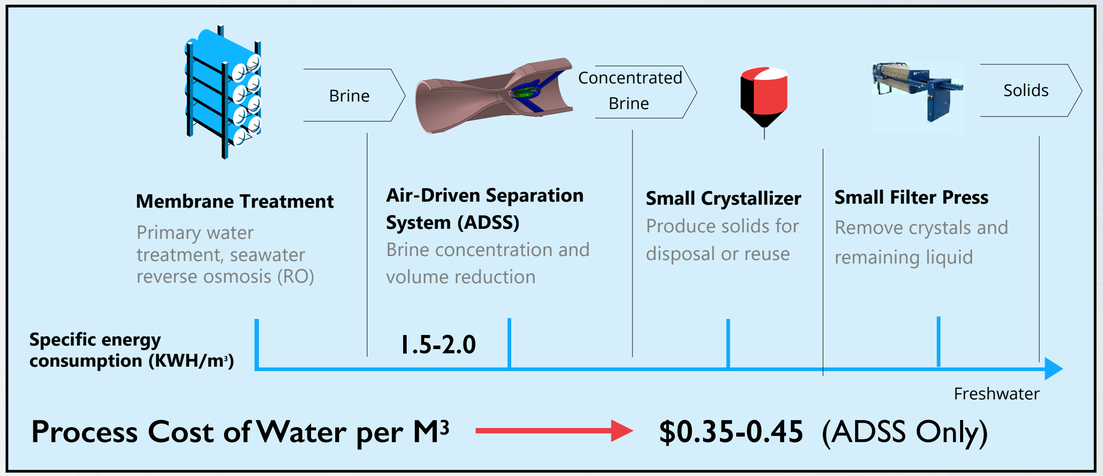
WR3® Zero Liquid Discharge

ZLD™

ZLD - Thermal Process



ZLD - ADSS Process



The ADSS can treat water with high TDS content and yield effluent that is highly viscous. This would make it ideal as both a pretreatment and first-stage concentration process application in a ZLD plant, significantly reducing the overall system complexity. A major difference between using the much less complex ADSS and traditional thermal desalination processes is the relatively lower specific energy consumption, which has been demonstrated in seawater purification by this process. These advantages would result in a much more cost-efficient ZLD plant, with potentially vast markets in the industrial wastewater and desalination industries.

WR3® SWRO Brine Concentration

Pretreatment

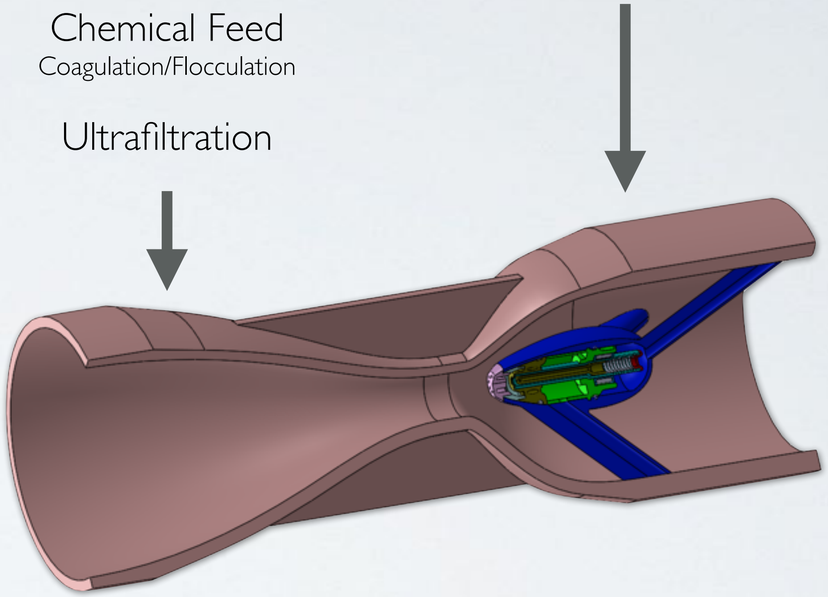
Clarifier/Reactor

Chemical Feed
Coagulation/Flocculation

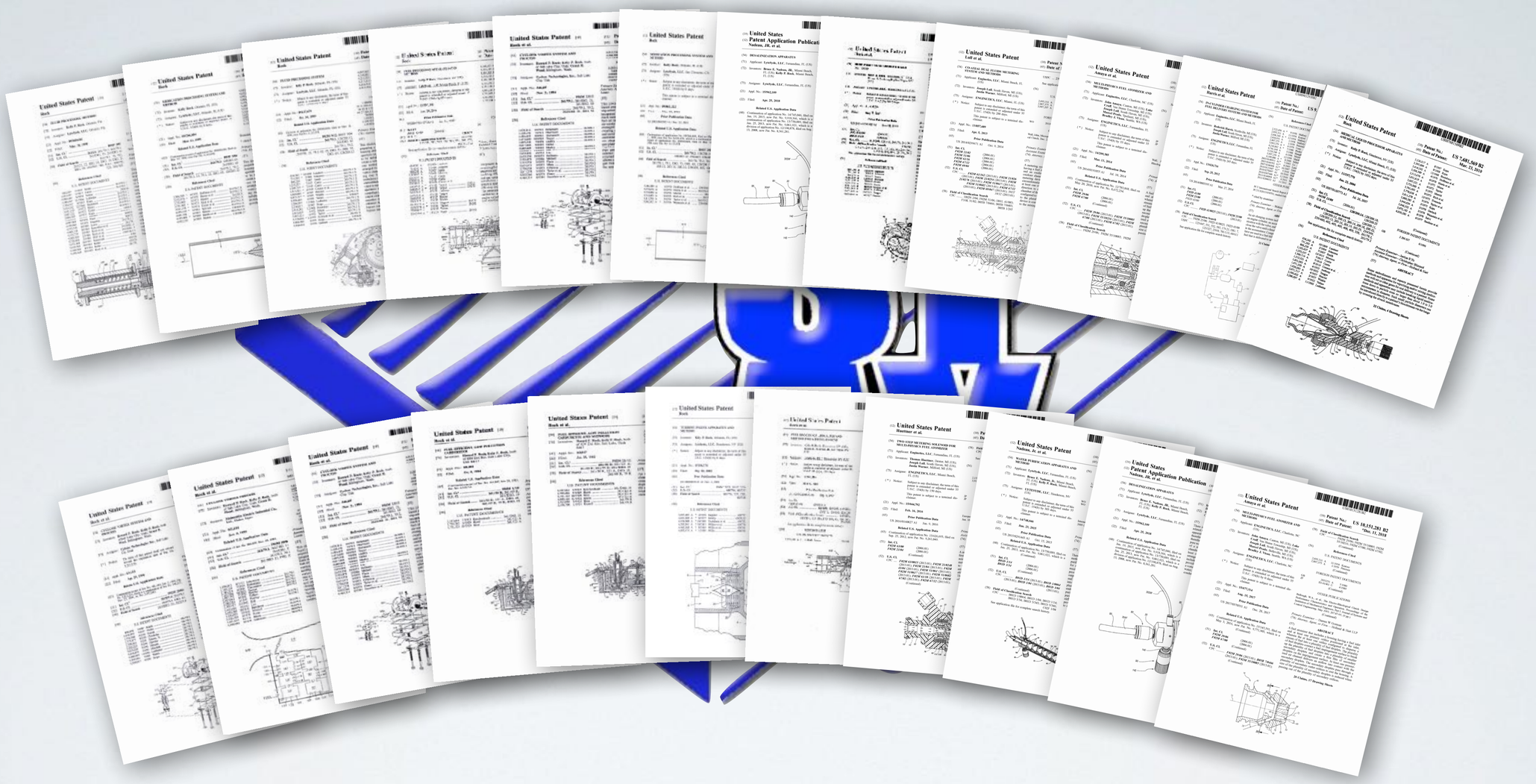
Ultrafiltration

First-Stage

Brine Concentration



There is a need for a ZLD solution to specifically address brine disposal in the desalination industry. Currently, most SWRO plants around the globe discharge billions of cubic meters of high-salinity brine, resulting from the membrane process, directly into the ocean. Stricter environmental regulations coupled with the escalating costs of constructing and maintaining brine outfall systems are making this traditional method less attractive both technically and economically. In fact, several GCC countries are forming a mandate to end brine disposal in the Arabian Gulf. The GCC represents 55-60% of the global capacity for desalination.



The STAX Companies have been issued 23 U.S. patents to date, with the most recent patent issuing on June 30, 2020. In addition to U.S. patents, the Company has numerous international patents issued and several patent applications pending in the U.S. and foreign countries.

The H2ORIGINS Team

Bruce E. Nadeau

Mr. Nadeau is the Co-Founder and Managing Director of V-STAX, LLC. Since the Company's inception, he has directed the multiple STAX technology application developments. He has also directed the organizational infrastructure and growth of H2Origins.

Mr. Nadeau is Chairman of the Board of Directors and has spearheaded and achieved the broad funding goals that have driven H2Origins forward from incubated concepts to proven technology and deliverables.

With an extensive business background ranging from establishing strong financial bases for start-up companies to structuring and negotiating company mergers, Mr. Nadeau previously established and directed innovative business entities in global property investment, marketing & PR, and new company development and organization. He also navigated the evolution and growth of numerous privately held corporate endeavors from medical companies to commercial aviation facilities.

Bruce Nadeau, Jr.

Bruce is the Director of Technical Advancements for the H2Origins development team. He conceived the innovative Multi-Physics Atomizer (MPA) and directed and oversaw its development at both Ricardo Engineering and AVL. He is also an inventor of the H2Origins water purification and desalination technology and poly-fluid distillation system (PFDS). Bruce continues to direct the development of the MPA and H2Origins PFDS and and their next generation devices.

Joseph Lull

Joseph is Lead Engineer for both the Enginetics MPA and the H2Origins PFDS desalination and water purification system development programs. He formerly headed the V-STAX research projects at Ricardo Engineering and AVL, which developed the MPA tip and supporting technology, and has been key to advancing H2Origin's low temperature distillation. He is an inventor of all of the Enginetics technologies and, along with Bruce Nadeau, Jr., is co-inventor of the newly designed PFDS.

Advisory Board

Mohamad Amin Saad

With over 37 years in technical expertise and plant experiences in membrane desalination and filtration technologies worldwide, Mr. Saad is a recognized international desalination expert. He has a proven ability to combine technical, business and commercial responsibilities in the desalination industry. An exceptional problem solver and negotiator, he has successfully interfaced and worked in close coordination with consultants, government agencies and private business clients.

As a leader in the business development efforts and delivery of desalination and water treatment projects throughout the world, he has worked in the Middle East, Europe and United States and has a worldwide network of key contacts and relationships. While a U.S. citizen, he is fluent in Arabic, several regional dialects and has vast bilingual, technical, literary and communications skills.

In the global desalination industry, he is a recognized expert in: membrane system and process design; plant design and consulting; plant startups & commissioning; and plant operation, performance monitoring, evaluation, optimization, and system trouble-shooting.

Mr. Saad is experienced in developing and conducting business in the Middle East/Arabian Gulf, India and U.S. markets and provides a vast network of key government and private sector decision makers, industry contacts and desalination market leaders.

Lawrence W. Cerenzie

Since the beginning of his chemical engineering career in 1974 with ARCO Oil & Gas and ARCO Alaska, Mr. Cerenzie has been involved with numerous disciplines and industries centered on the production and use of energy. These projects range from breakthrough combustion engineering research for improved engine designs to military “signature reduction projects” to evaluating large-scale alternative energy projects and overseeing the design & startup of landmark oil & gas projects in the United States and throughout the world.

Mr. Cerenzie proposed a novel solution to resolve Toyota’s “runaway cars” and brake failure issues as well as other design flaws for major manufacturers using NASA’s Failure Analysis and “3 Levels of Safety” Methodology to create essentially “inherently safe and reliable” cars. The proposal was presented to Congress by Sen. Orrin Hatch and adopted. Mr. Cerenzie also proposed a new oilfield design plan and methodology for offshore Gulf of Mexico development to prevent another BP-Horizon Macondo Disaster utilizing the same NASA Failure Analysis and new interactive methods for designing wells.

Mr. Cerenzie’s specific energy project focus and involvement includes testing, economic evaluation, strategic planning, design, construction, and the start-up and operation of energy facilities including oil fields, tar sands and alternative energy. Hydrocarbon projects range from the Prudhoe Bay and Kuparuk oilfields in Alaska and massive oilfields in Kazakhstan to enhanced recovery projects, tar sands and the oil shale deposits of Utah. His ARCO Alaska experience included materials engineering and plant design, R&D, and Prudhoe Bay Start-up Team member, where he initiated the Prudhoe Bay well-by-well off-take planning strategy to increase well recoveries. He also oversaw the Kuparuk project design effort for ARCO Alaska and ARCO Oil & Gas, supervised the Prudhoe Bay Gas Cap Ownership Redetermination well-testing effort, and had temporary assignment to oversee the Prudhoe Bay Well Operations and Surveillance Engineering Group.

Advisory Board

Dave Winston

Dave Winston is the leader of Caldwell Partners' Industrial Practice and the head of its Dallas office. With nearly 20 years of executive search experience, Dave has completed searches for board directors, chief executive officers, presidents, chief operating officers, and chief financial officers. He has placed these executives in start-up firms, small and medium-sized public and private firms, and major corporations.

Dave joined Caldwell Partners from Heidrick & Struggles, where he was the Industrial Practice Regional Managing Partner for the Americas and Partner-in-charge of the Dallas office. Previously, he was co-founder of a Boston-based recruiting firm focused on venture-backed startups and served in advisory positions to several technology companies. Prior to his executive search career, Dave was an owner and Chief Operating Officer of a company that provided an outsourced supply chain for perfusionists and hospitals performing cardiac surgery procedures.

Before his corporate career, Dave was an officer in the US Marine Corps for twenty years. He held numerous flying assignments, served as the chief of global programs for the Special Ops Command, and served on the staff of Marine Weapons and Tactics Squadron One.

Dave serves on the board of Heroes on the Water, a non-profit organization that helps wounded warriors rehabilitate and reintegrate through kayak fishing and the outdoors. A National Association of Corporate Directors (NACD) board leadership fellow, Dave also serves on the advisory board of the North Texas Chapter. He is a member of the Helicopter Association International, holds an FAA commercial rotary-wing instrument pilot certificate, is a former 20-year US Soccer Federation Referee, and has completed eight triathlons.