

Water Hives™

Brief Description

Redfish Water Solutions is a team of semiconductor engineering veterans who have developed a transformational, new water cleaning technology. Water Hives can replace reverse osmosis as the global technology leader in providing green, low energy, clean water solutions to semiconductor, desalination and many more industries.

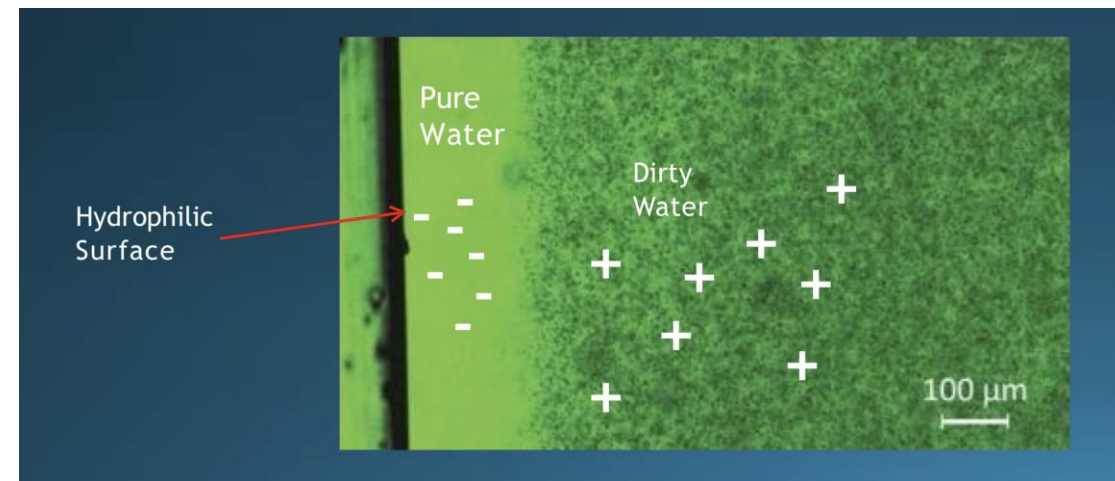
Problem

Reverse osmosis (RO) in semiconductor, desalination and other industries creates 0.5% of annual global CO₂ emissions by requiring massive amounts of energy to pressure water through the reverse osmosis membranes. Semiconductor and other industries suffer the costs of the excessive energy demands and the heavy carbon footprint of RO.

Solution

Water Hives have been developed being a new, patented technology that harnesses the free-energy effects of hydrophilicity to purify water, completely displacing the costly and inefficient reverse osmosis process. Planning for a bench top prototype has begun, with conversations with multiple university labs.

HQ	Boise, ID
Business stage	Proto design
No. of people	4
IP Rights	Yes
Founded	June 23, 2021



Water purification systems including an inlet chamber, a purification module, a purified water outlet, and an impure water outlet. The inlet chamber is configured to receive an input water stream. The purification module includes a purification chamber configured to divide the input water stream into a purified water stream fluidly coupled to the purified water outlet and an impure water stream fluidly coupled to the impure water outlet. The purification chamber includes a first hydrophilic surface and a second hydrophilic surface spaced from the first hydrophilic surface. The first hydrophilic surface and the second hydrophilic surface cooperate to establish purified zones of substantially pure water and an impure zone of impurity concentrated water from the input water stream. The purified water stream is supplied by substantially pure water from the purified zones and the impure water stream is supplied by the impurity concentrated water from the impure zone.

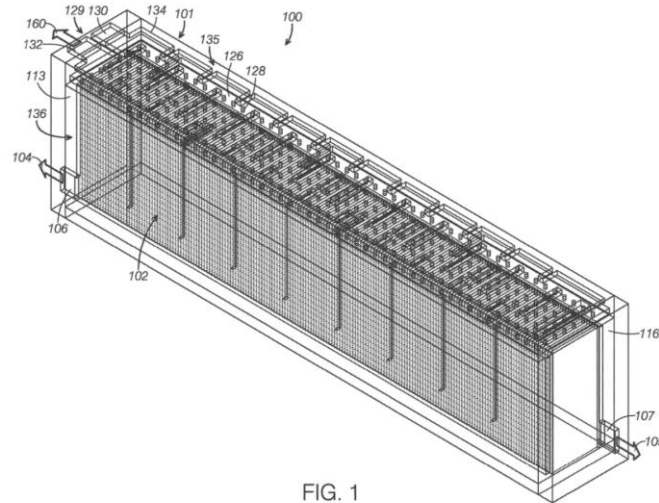


FIG. 1

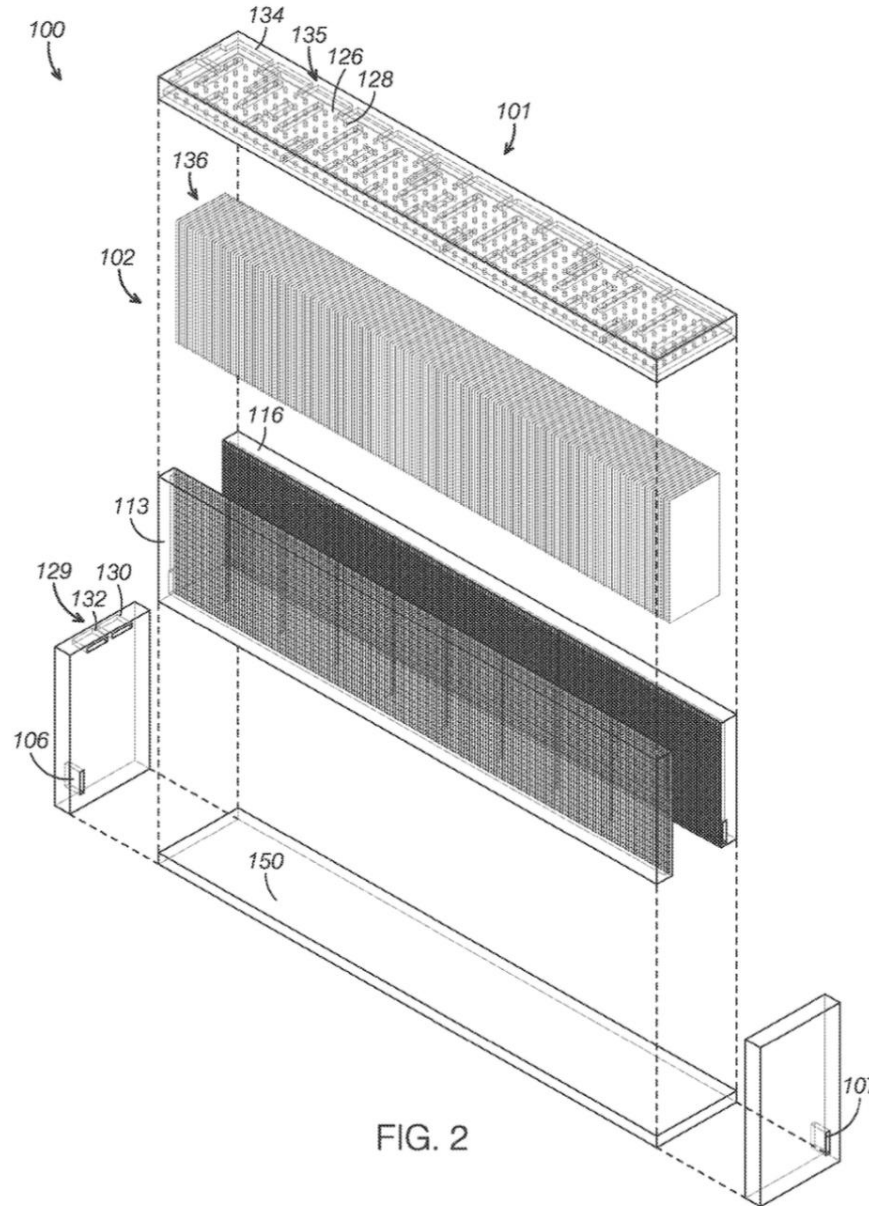
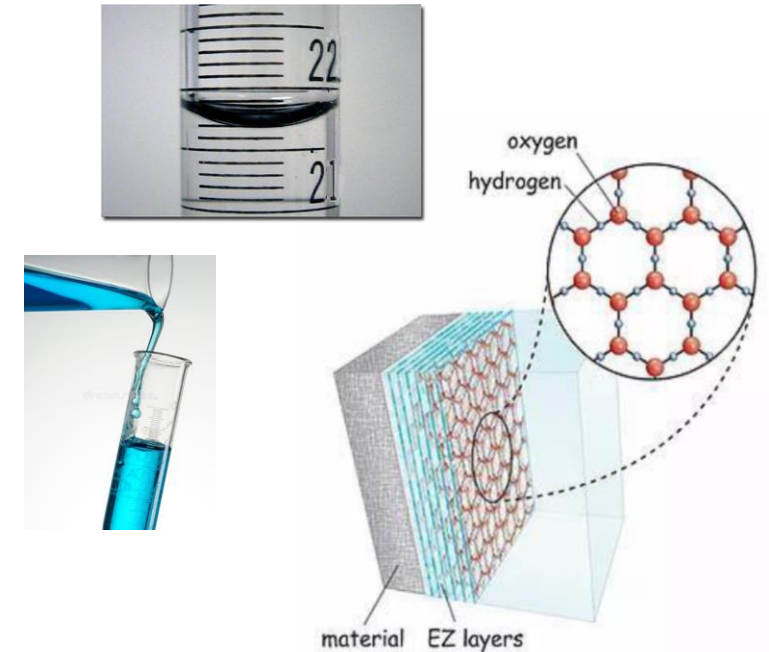
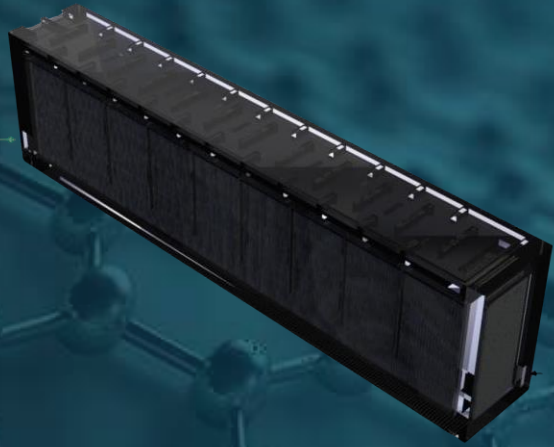


FIG. 2

Hydrophilicity, or adhesion, occurs on a glass surface because the attraction of the molecules is stronger than bond of the water by itself. The simplest example is the curvature of the water on the edges of any glass container or when water sticks the edge of the glass when pouring.

Hydrophilic surfaces have highly polarizing groups such as -OH groups at the surface which being polar in nature strongly attract the H-O-H molecules, expelling everything else from the vicinity.





Patented

Water Hives™

Mission

To be the global technology leader in delivering green, clean water solutions to the world.

Individual Water Hive
Length ~6"



Purpose

To clean the world's water, while reducing the carbon footprint of current water processing.

Critical industries such as semiconductor and desalination can now expand efficiently with Water Hives.

It's a deadly tradeoff.

DROUGHT



OR

GLOBAL WARMING



Fighting drought with current water tech is choosing to increase global warming.

Water Hives water purification modules resolve this.

Our corporate social responsibility

Globally at least 2 billion people drink contaminated water

- cholera
- dysentery
- typhoid
- polio

Contaminated water is estimated to cause 485,000 diarrheal deaths each year. [Source](#)

By 2025, two-thirds of the world's population will be living in water stressed areas. [Source](#)



Together, we can solve this.

Water Hives can provide clean water to those countries with little to no electrical infrastructure or the supporting economy, to develop facilities to address these debilitating issues.

Countries with the worst access to clean water

Percentage of Population Lacking Basic Water Services

Eritrea	80.7%
Papua New Guinea	63.4%
Uganda	61.1%
Ethiopia	60.9%
Somalia	60.0%
Angola:	59.0%
D.R. Congo:	58.2%
Chad:	57.5%
Niger:	54.2%
Mozambique:	52.7%



Water contaminated with diarrhea, cholera, dysentery, typhoid, and polio can easily be converted into safe drinking water using Water Hives technology. Water Hives will deliver point-of-use water cleaning systems to the people of these countries. No electricity or thermal energy is needed, and Water Hives can be placed nearly anywhere quickly and easily.

Countries most threatened by water shortages



- Western Sahara
- Libya
- Jordan
- Djibouti
- Yemen

Desalination using Water Hives could establish these coastal countries with their own independent water production without increasing the global carbon footprint risk, as thermal distillation and reverse osmosis are currently doing.

RO = High Carbon Footprint!

~0.5% of Total Annual Global CO₂

- The global RO membrane market was estimated to be \$11.7B in 2020
- Projected to reach \$19.1B by 2025 (CAGR of 10.3%)
Doubling the CO₂ impact by 2025 [Source](#)
- RO uses 10-13 kWh/1000 gallons water [Source](#)
- The USA uses ~\$332B GPD (2015 figure) [Source](#)
 - ~ 3.22 Billion kWh per day
 - ~ 1175.3 Billion kWh per year

Water Hives can prevent this.

Disruptors in History

Obsolete Technology

Horse Carriage

Vacuum Tube Transistors

Thermal Distillation

Reverse Osmosis

Disruptor Technology

Automobiles

Solid State Transistors

Reverse Osmosis

Water Hives

US innovation & competition act

The United States can be the world's technology leader in clean water by eliminating the global warming impact of current water filtration technologies.

Water Intensive Industries

Desalination

Household water

Food & Beverage

Agriculture

Pharmaceuticals

Semiconductor

Automotive

Aerospace

Oil and Gas

Growth in any of these industries will accelerate global warming simply from using current water filtration technologies.

Converting to Water Hives can ensure that these industries expand responsibly.

Semiconductor Industry

- Generates wastewater contaminated with heavy metals and toxic solvents
- A single Fab uses 2-4 million gallons of ultra-pure water per day [Source](#)
- Intel Fabs alone use 12.8 billion gallons per year
- Intel and the state of Oregon are investing \$120M on a new RO water reclaim facility
- The Intel facility will clean more water, yet continue adding to the global carbon footprint
- \$53B for semiconductor in the Endless Frontiers bill will guarantee more global warming if Semiconductors are allowed to expand without converting from reverse osmosis to Water Hives
- Converting to Water Hives can reduce the costs and carbon footprint impact of both ultra-pure water production and wastewater clean-up, while improving the efficiency of both

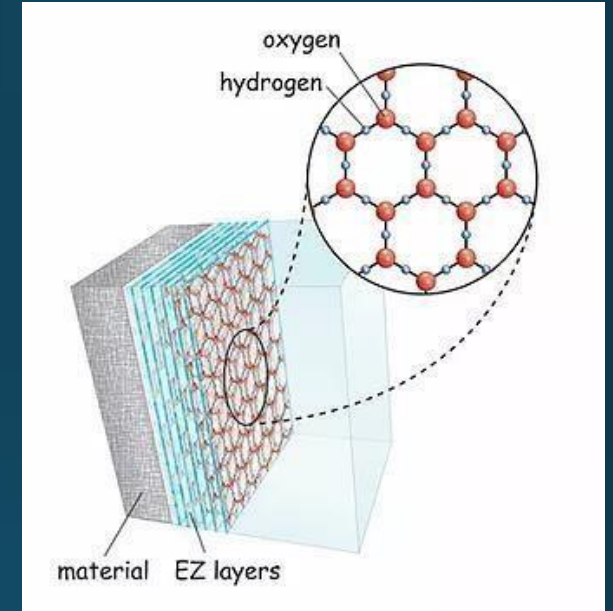
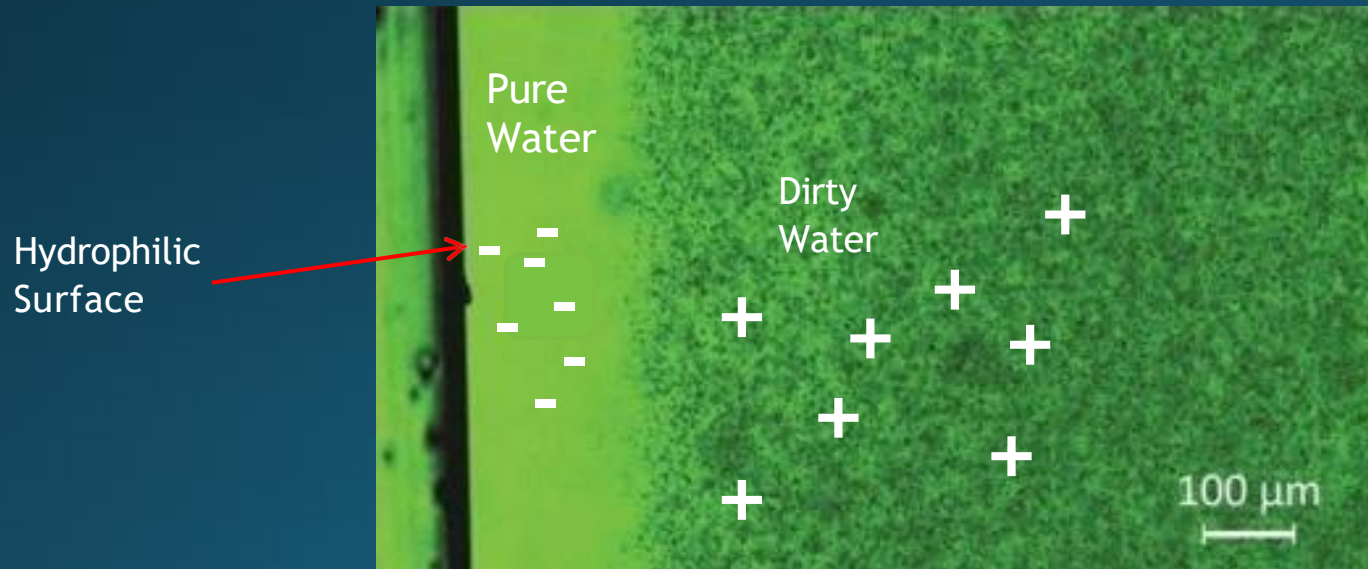


Water Hives™

How do they work?

Based on the 4th phase of water

When a hydrophilic surface comes into contact with water, an exclusion zone of 100% pure water is formed. Our tech uses microcapillary action to pull the water from the pure water and dirty water zones. Our tech also has the possibility to be used to generate electricity by utilizing the battery potential of the oppositely charged water zones.

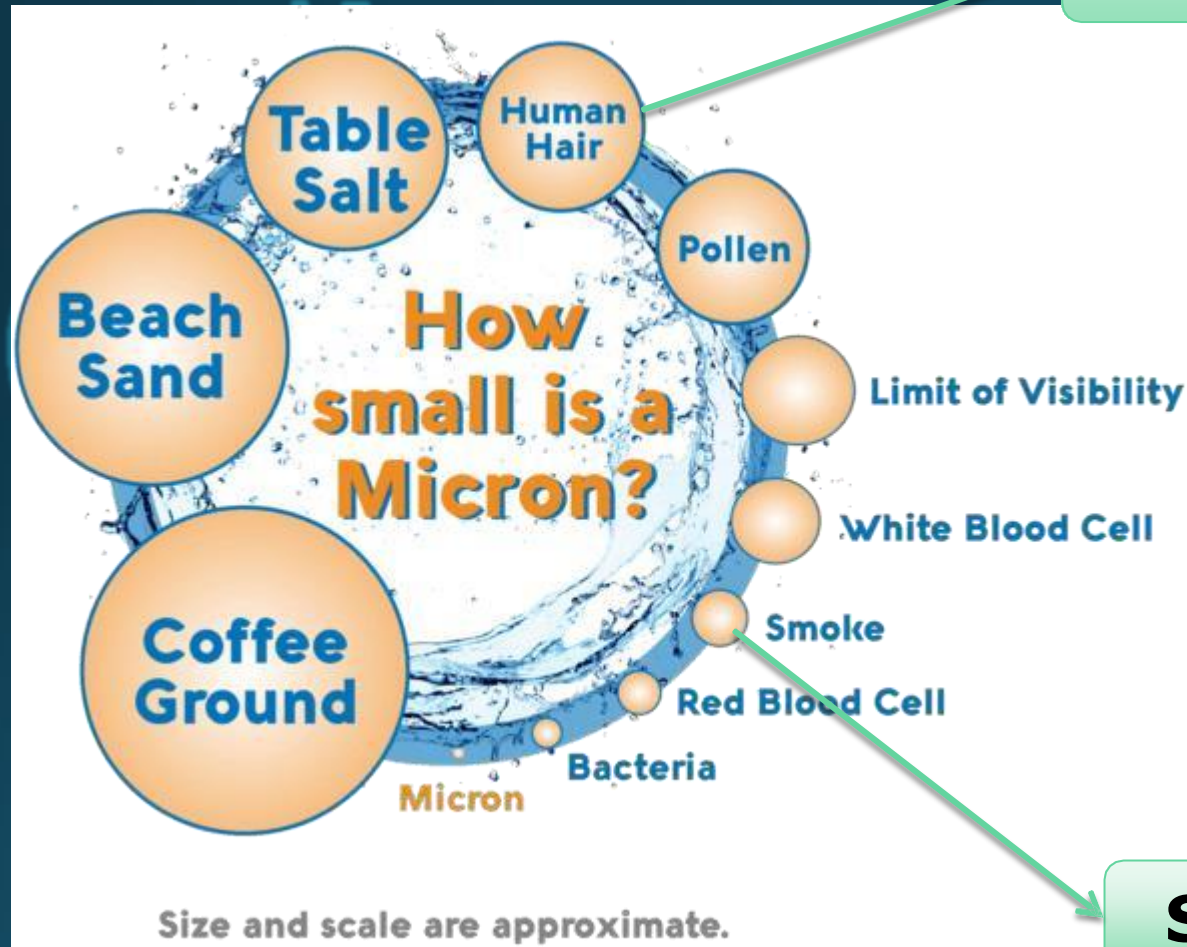


Hydrophilic surfaces have highly polarizing groups like -OH groups at the surface which are polar in nature that attracts the polar H-O-H molecules very strongly, and thus contaminants can then be expelled from the vicinity.

Water Hives are cleaning on microscopic levels

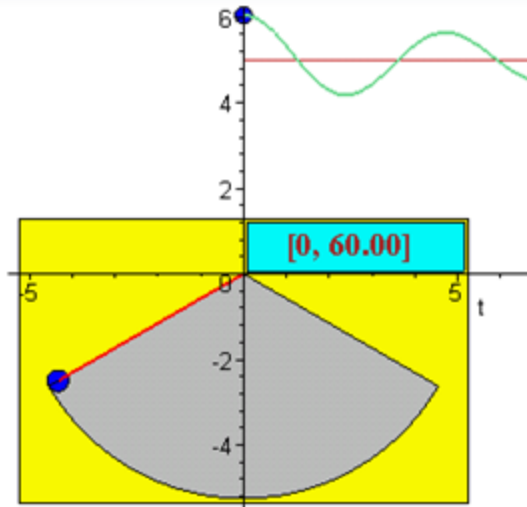
Size of Exclusion zone

Our Water Hive manufacturing materials and design use microfabrication processes from already well-established semiconductor industry processes and 3D printing of Water Hive components. Making manufacturing materials inexpensive and plentiful, leading to reduced manufacturing costs.



Size of our Capillaries

Intrinsic properties and why it works without electricity



Simple pendulum dampens eventually

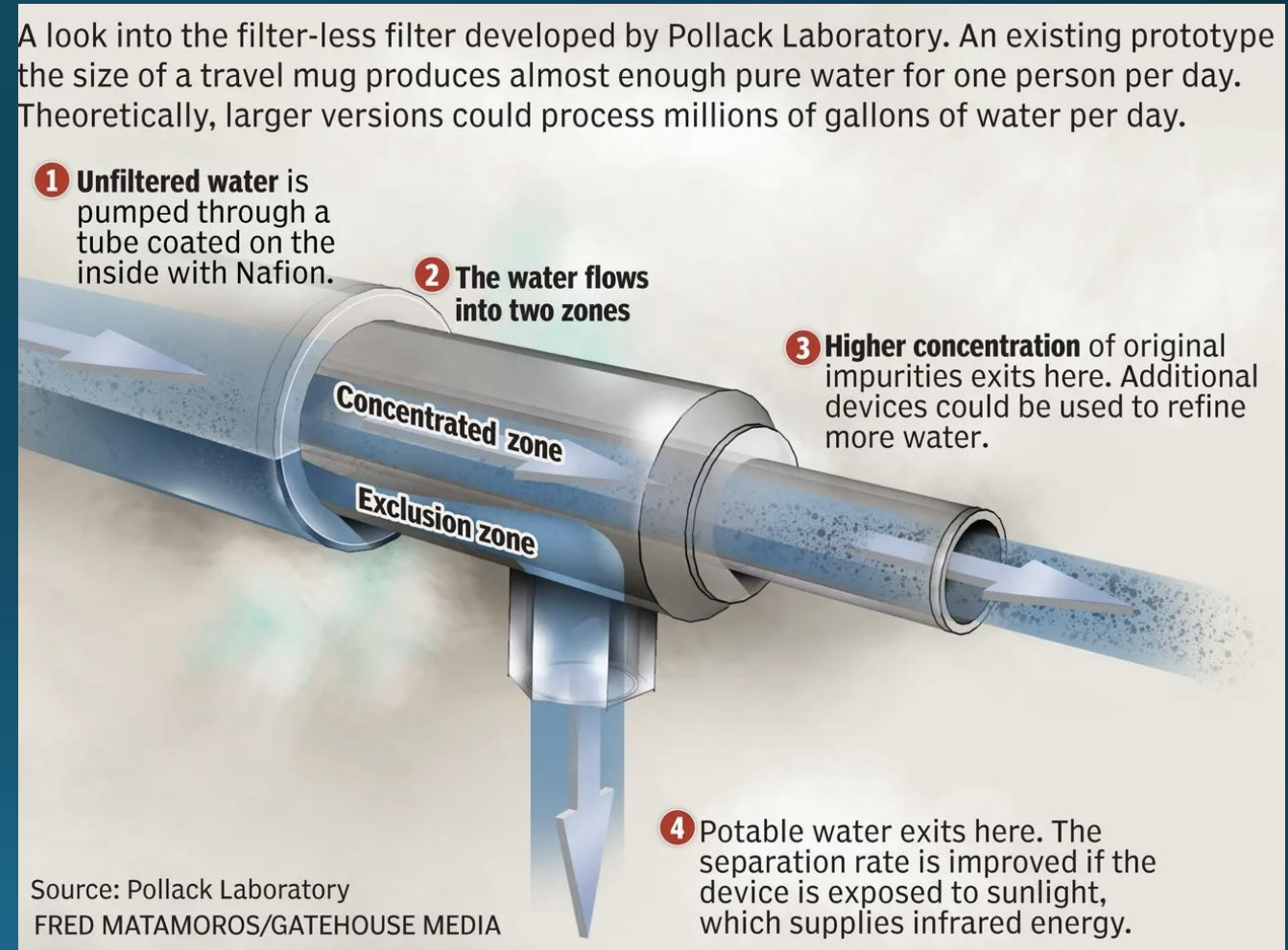
Magnetically assisted pendulum keeps oscillating infinitely



- Water Hives use the intrinsic material properties of hydrophilicity, capillary action, and gravity to adjacent hives
- Hydrophilic surfaces attract water naturally
- Capillary action pulls water thru the process
- This all results in an extremely low energy system

Proof of Concept

- Pollack's filter-less filter serves as a proof of concept.
- The experiment demonstrated a separation of 200:1 in a single pass.
- Non-optimal design for manufacturing due to:
 - Dynamic system design resulting in low efficiency of filtration
 - Precise control tolerances in HVM (high volume manufacturing) will be costly due to poor yield
 - Difficulty in modularity
- Water Hives has a superior engineering design creating better performance due to:
 - Static system design, with a high efficiency of filtration
 - Precise control of tolerances in HVM is already established
 - Ease of scalability



Water Hives Technology Advantage

Reverse Osmosis

- Creates 0.5% of global CO₂, annually
- High energy consumption
- Fouling and maintenance costs
- Perpetual replacement
- Creates plastic waste
- Limited scalability

Water Hives

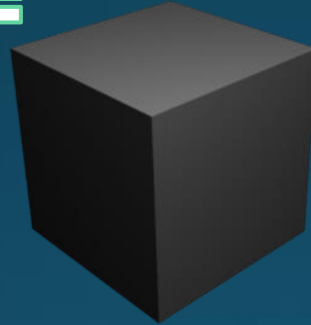
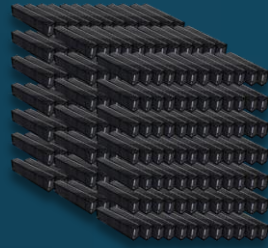
- Made in the USA
- Eliminates RO's carbon footprint
- Potential to generate electricity
- Reduced-fouling
- Minimal maintenance
- Lifetime product
- Uses recycled materials
- Easily scalable
- 3D print capable –
manufactured at the source

Vision



Single Water Hive

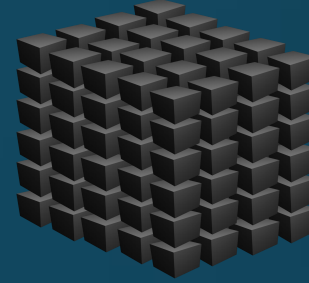
~Size of 6" ruler



Water Hive Cell

Multiple water hives working in tandem.

~Size of car battery



Water purification plant

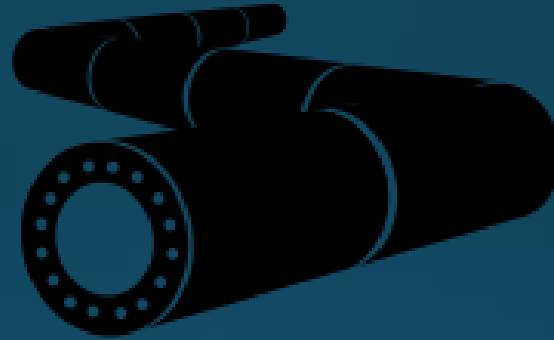
Multiple batteries stacked together in server like fashion

Very high scalability

Additional uses for Water Hives tech

Chemical concentrators:

- Can help concentrate diluted chemical solutions without electricity, combined with dimethyl ether processes for efficiency and pre-filtering
- Hazardous chemicals can be:
 - Diluted at the source
 - Transported in pipelines, instead of trucks, to the destination
 - Concentrated at the destination without the use of electricity

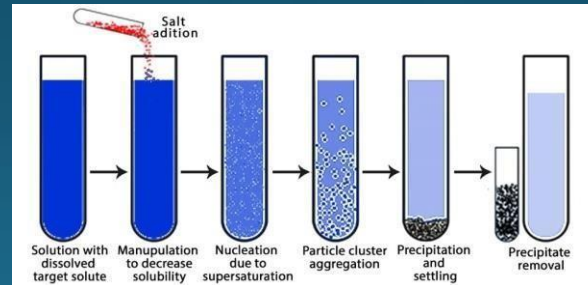


Instead of



Salt concentrators:

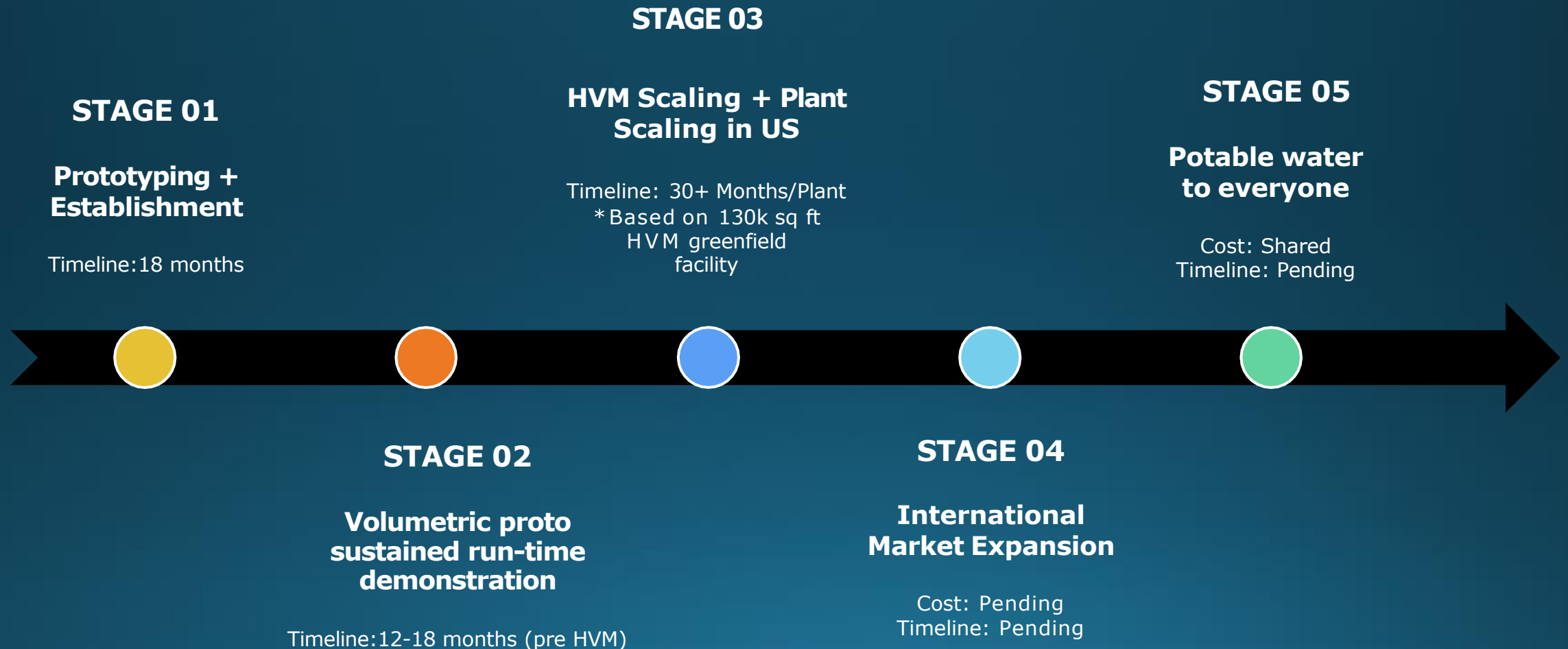
- Can help concentrate saline solutions to near saturation
- Solid salt can then be extracted by lowering the temperature



Instead of



Roadmap



Jerry Young

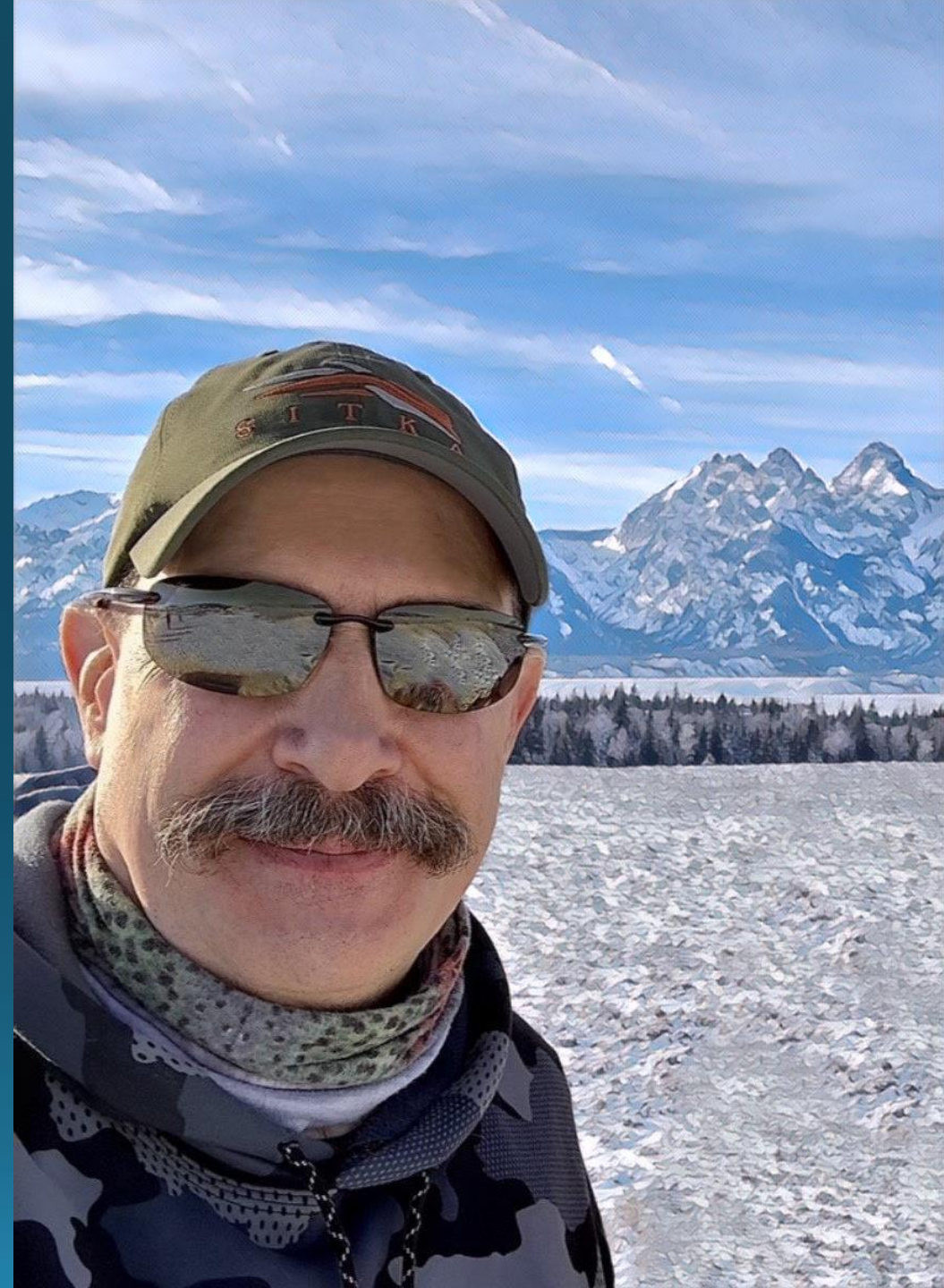
CEO

Functions at Water Hives:

- Implementation of manufacturing and engineering aspects, from concept- phase to manufacturing release
- Leveraging domestic production and supply chain resources to maintain a stable basis for product launch
- Ensuring a skilled, creative and stable engineering team is recruited, developed, and retained

Professional Background:

- High-tech engineering leader across semiconductors, high-volume technical manufacturing, and large industrial processing facilities
- Executive team member for green energy production development company
- Project Engineering Leader for the largest off-peak solar production facility in the U.S.
- 30+ years experience within manufacturing implementation, research & development, engineering management and new product development
- Holder of several U.S. patents and published white papers across multiple technology areas



Michael Hall

President/Co-Founder

Functions at Water Hives:

- Executing the corporate roadmap to ensure the successful launch and growth of Water Hives
- Develop new business and government partnerships to support the corporate vision
- Leading and developing with the executive team

Professional Background

- 34 years of Semiconductor Manufacturing, Engineering and Management
- 5 years of establishing technology divisions for startups



Brooks Roberts

Chief of Staff/ Co-Founder

Functions at Water Hives:

- Support CEO
- Collaboration with executive team members to ensure focused and efficient business and manufacturing strategies
- Enabling all staff to support executive leadership and work together to ensure the vision of the company

Professional Background:

- 25 years of semiconductor manufacturing in a QA/QC Engineering capacity
- 5 year of establishing technology divisions for startups
- Multiple roles with companies involved with water contamination in the petroleum industry, and investigating soil and water contamination for environmental property assessments



Paul Taylor

Manager of QC

Functions at Water Hives:

- Leading and developing the quality teams for Water Hive manufacturing
- Working with executive leadership to develop a viable manufacturing plan

Professional Background

- 19+ years of semiconductor manufacturing experience in a Global Quality capacity
- 10+ years starting, running, and fostering new startup companies



Thank you