

WATER RECYCLING AND REUSE



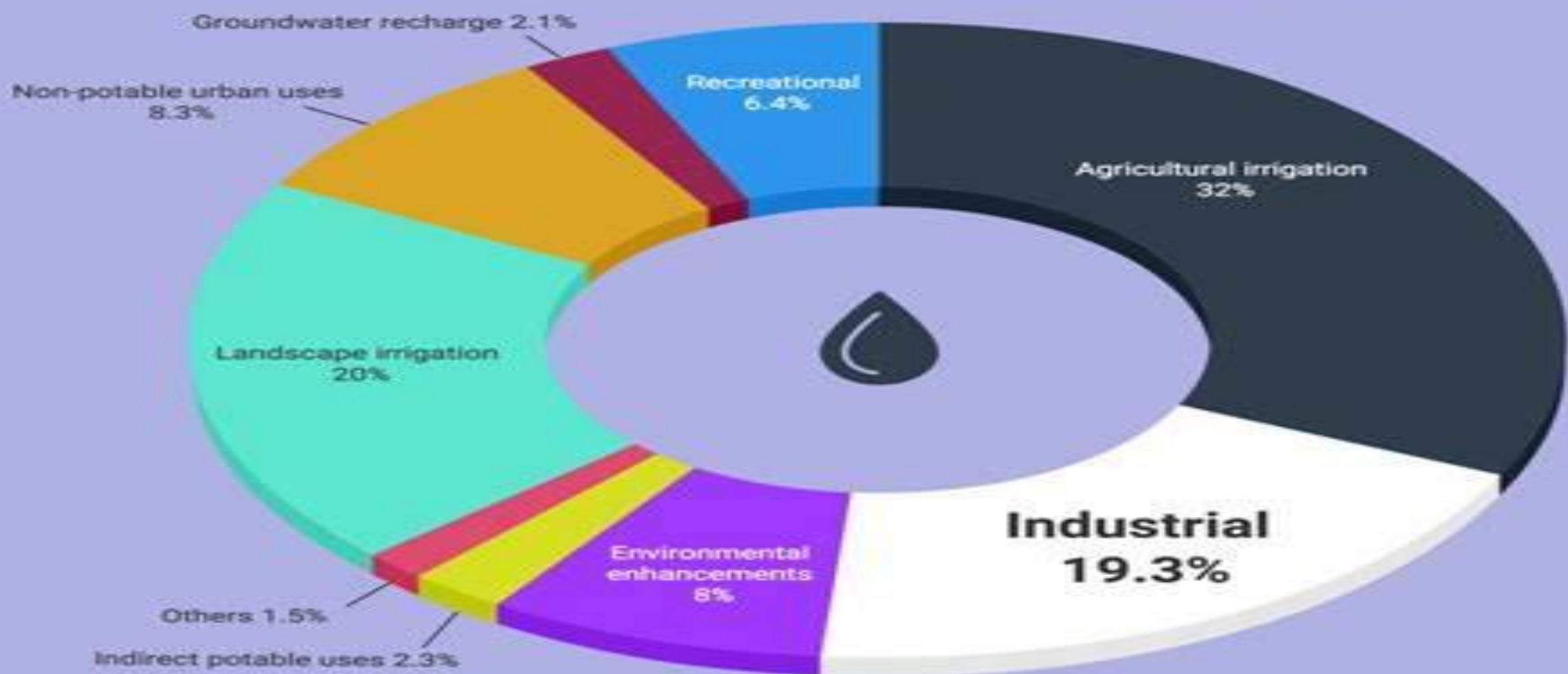
By 2027, the volume of recycled water produced in the United States is projected to increase 37% from 4.8 billion gallons per day to 6.6 billion gallons per day, according to a recent survey by Bluefield Research.

What Is Water Reuse?

Water reuse, also known as water recycling, is the process of intentionally capturing wastewater, stormwater, saltwater or greywater and cleaning it as needed for a designated beneficial freshwater purpose such as drinking, industrial processes, surface or ground water replenishment, and watershed restoration.

Water reuse by application

Global water reuse after advanced (tertiary) treatment



Design Professional's Practice Guide for Integrating:

ONSITE WATER USE AND REUSE

Water is a finite resource. And yet almost all architects and engineers do not consider water reuse in the design, construction and operations of our buildings and neighborhoods.



COMMERCIAL OFFICE



95% of water used in commercial office buildings can be supplied from **non-potable sources**

- Toilet Flushing
- Cooling Tower
- Irrigation



RESIDENTIAL



50% of water used in multi-family residential homes can be supplied from **non-potable sources**

- Irrigation
- Clothes Washer
- Toilet Flushing

What is Wastewater Reuse?

Terminology

- **Water reuse**
 - The beneficial use of treated wastewater for agriculture, industry, etc.
- **Water reclamation**
 - Reclamation involves all processes used to treat wastewater so that it can be beneficially reused
- **Water recycling**
 - Recycling generally means reuse of wastewater back in the same cycle where it is generated.

What is Wastewater Reuse?

Categories of Water Reuse

- Indirect Reuse

- Reuse of wastewater within the context of natural water systems (rivers, aquifers, etc.). The ultimate indirect reuse is through the global hydrologic cycle



- Direct Reuse

- The direct beneficial reuse of treated wastewater for agriculture, industry, etc.
- Direct potable reuse: the reuse of reclaimed water for potable uses

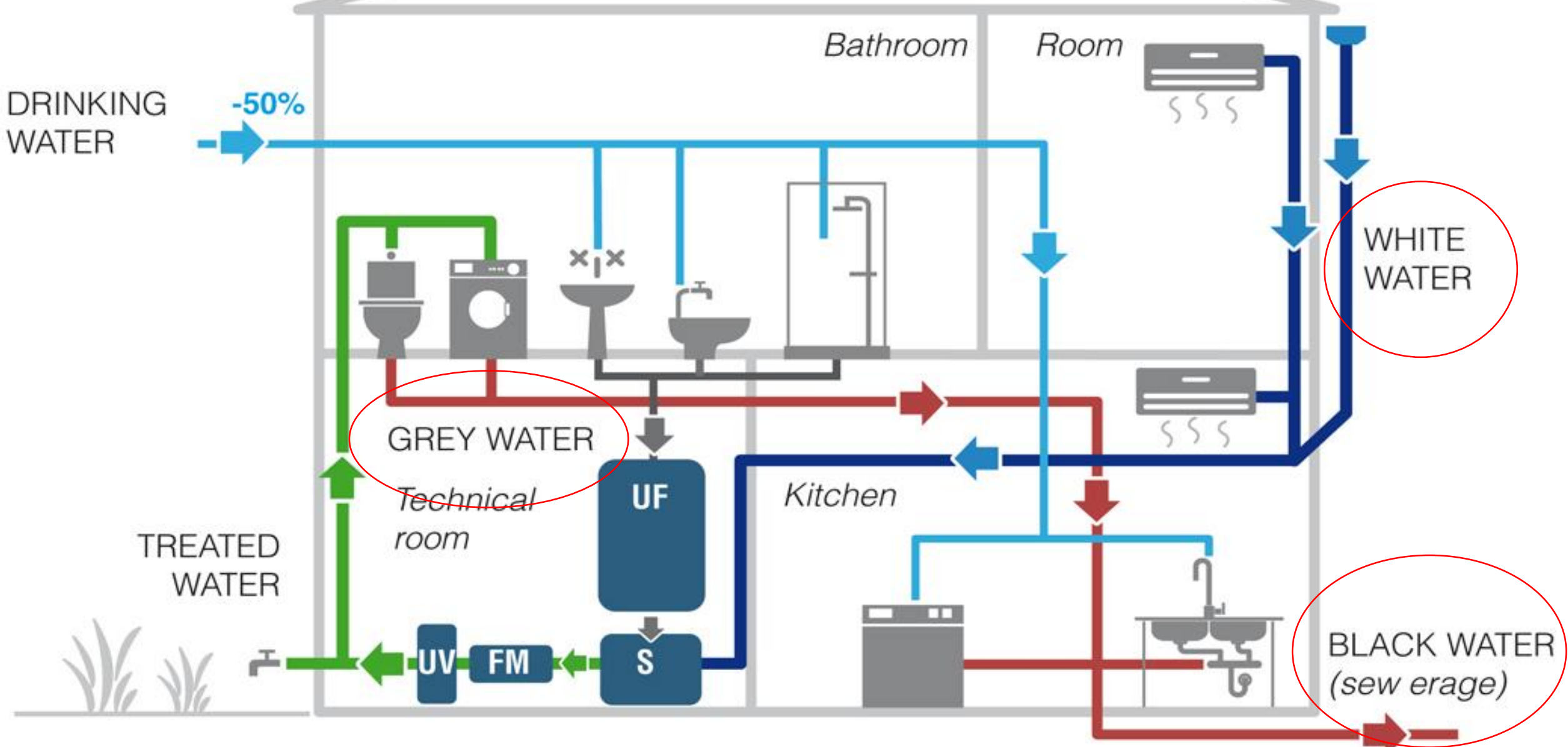


Considerations for Water Reuse Planning

The foundation of successful water reuse programs:

- Providing reliable treatment to meet water quality requirements and environmental regulations for the intended reuse.
- Protection of public health and the Environment
- • Gaining public acceptance.
- Economic viability

OPERATORS LEARN YOUR COLORED WATERS



Ohio Administrative Code (OAC)

3701-29-17 Gray water recycling systems and alternative toilets

(1) Gray water discharged to all GWRS shall only consist of domestic type flows having the consistency and strength typical of gray water from domestic households. The source of gray water may include water from bathing, showering, washing clothes or laundry sinks. Gray water shall not contain water used to wash diapers, or other materials soiled with human excreta or infectious materials, or wastewater that has come in contact with toilet waste, toxic substances, cleaning chemicals other than soap, water softener backwash or any other hazardous household products.

How can we get there



Membrane Processes

Four common types of membranes:

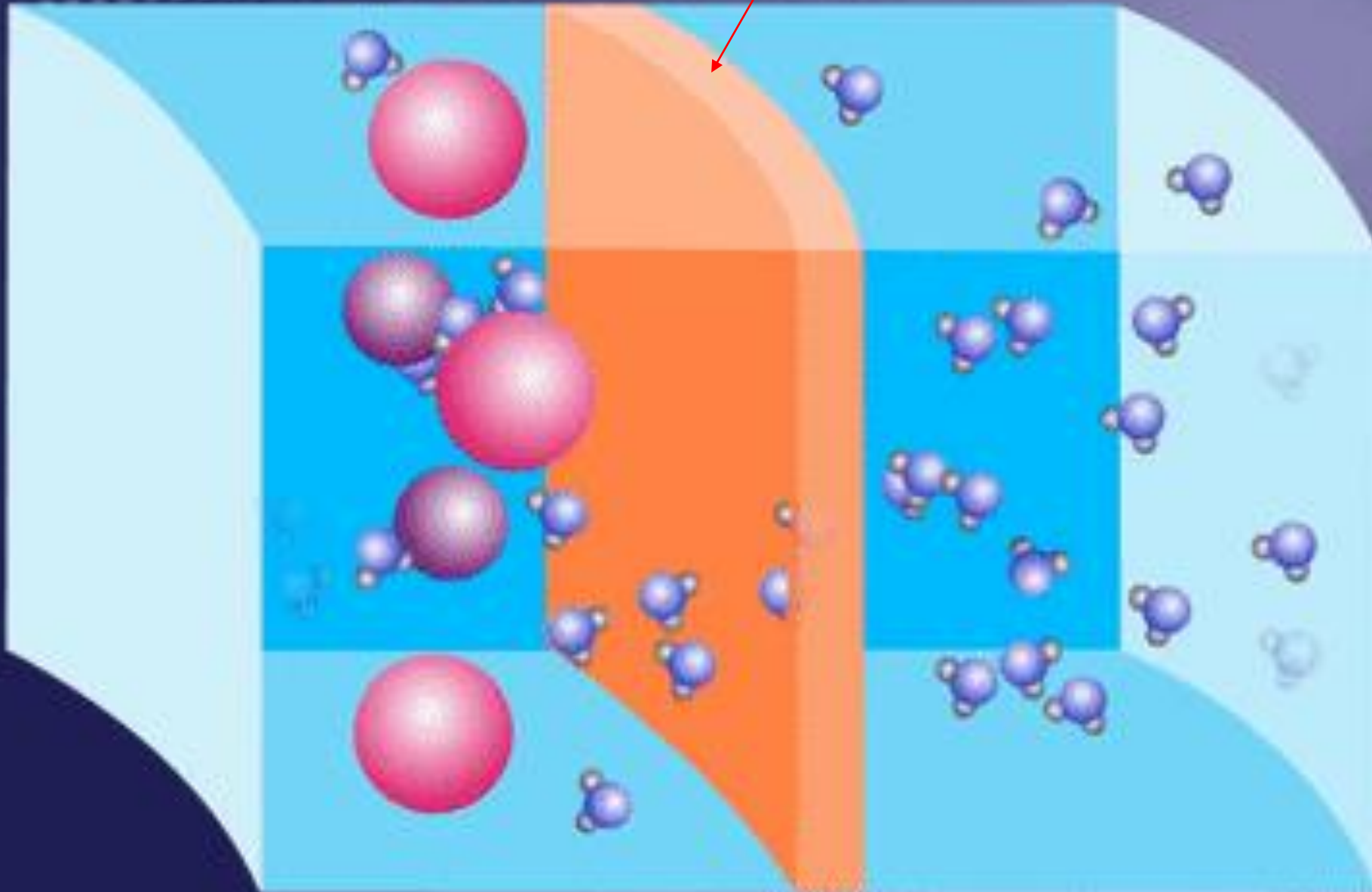
Reverse Osmosis

Nanofiltration

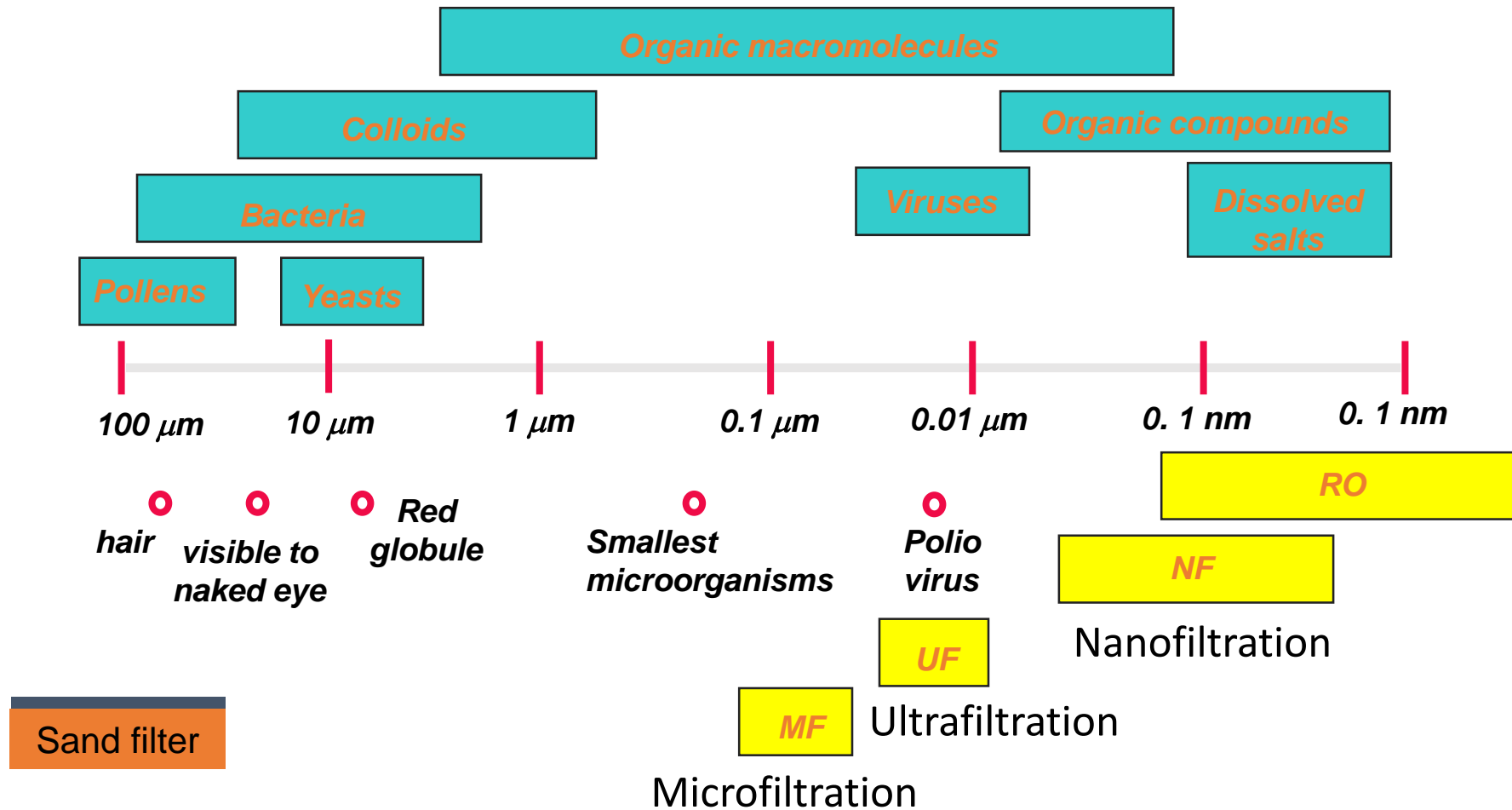
Ultrafiltration

Microfiltration

PORE SIZE MAKES THE DIFFERENCE



Membrane Classifications (Pore Size)



Full-Scale WWTP Membrane Bio Reactor (MBR)

COMPARISON

Parameter	MBR Effluent mg/l (%)	Conventional Effluent mg/l (%)
SS (mg/l)	<2 (99)	25 (73.2)
BOD ₅ (mg/l)	4 (95.8)	19 (82.3)
COD (mg/l)	27 (88.5)	66 (77.2)
TN (mg/l)	9.2 (73.7)	15.9 (54.5)
TP (mg/l)	2.4 (36.1)	3.4 (8.6)

YOU CHOOSE H₂O OPERATOR

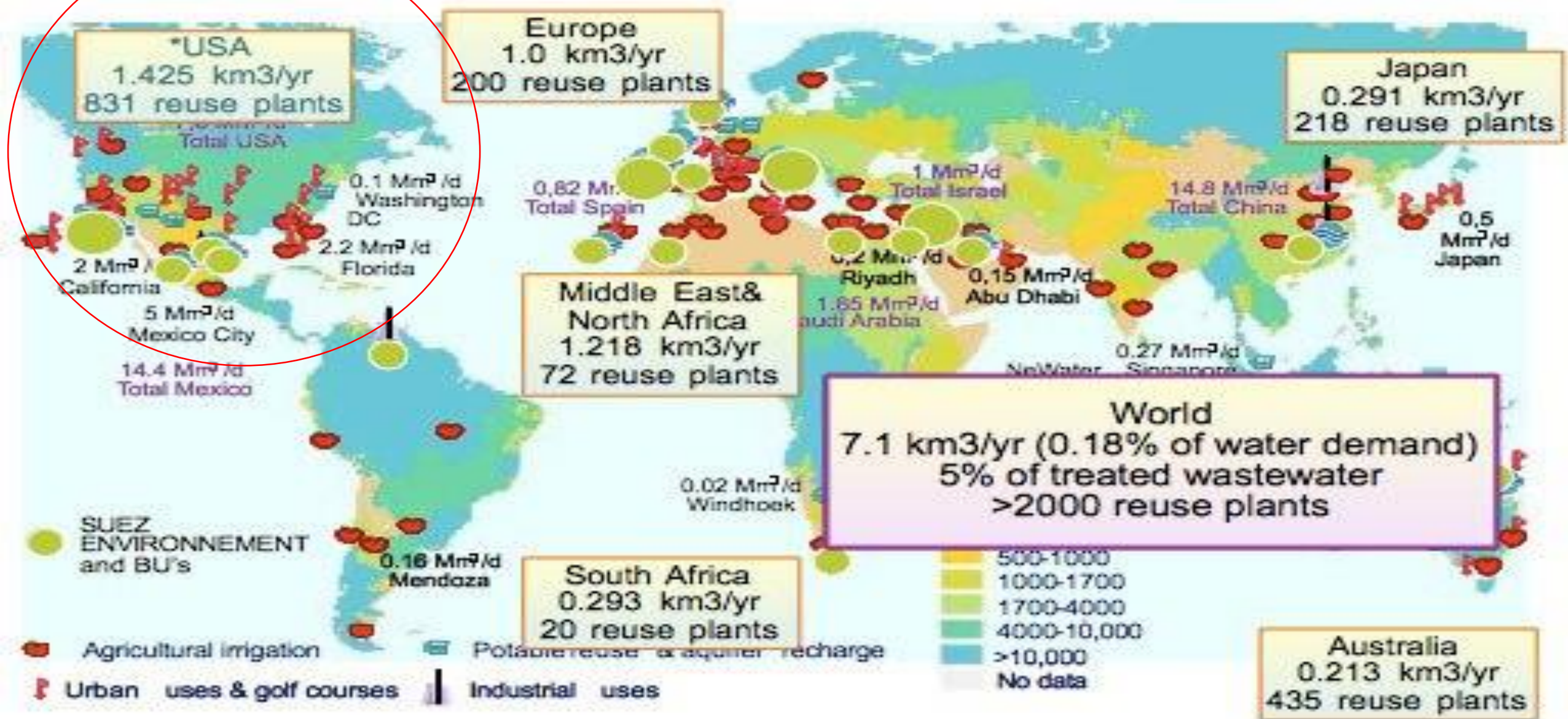


RIVER WATER



WRRF FINAL
EFFLUENT

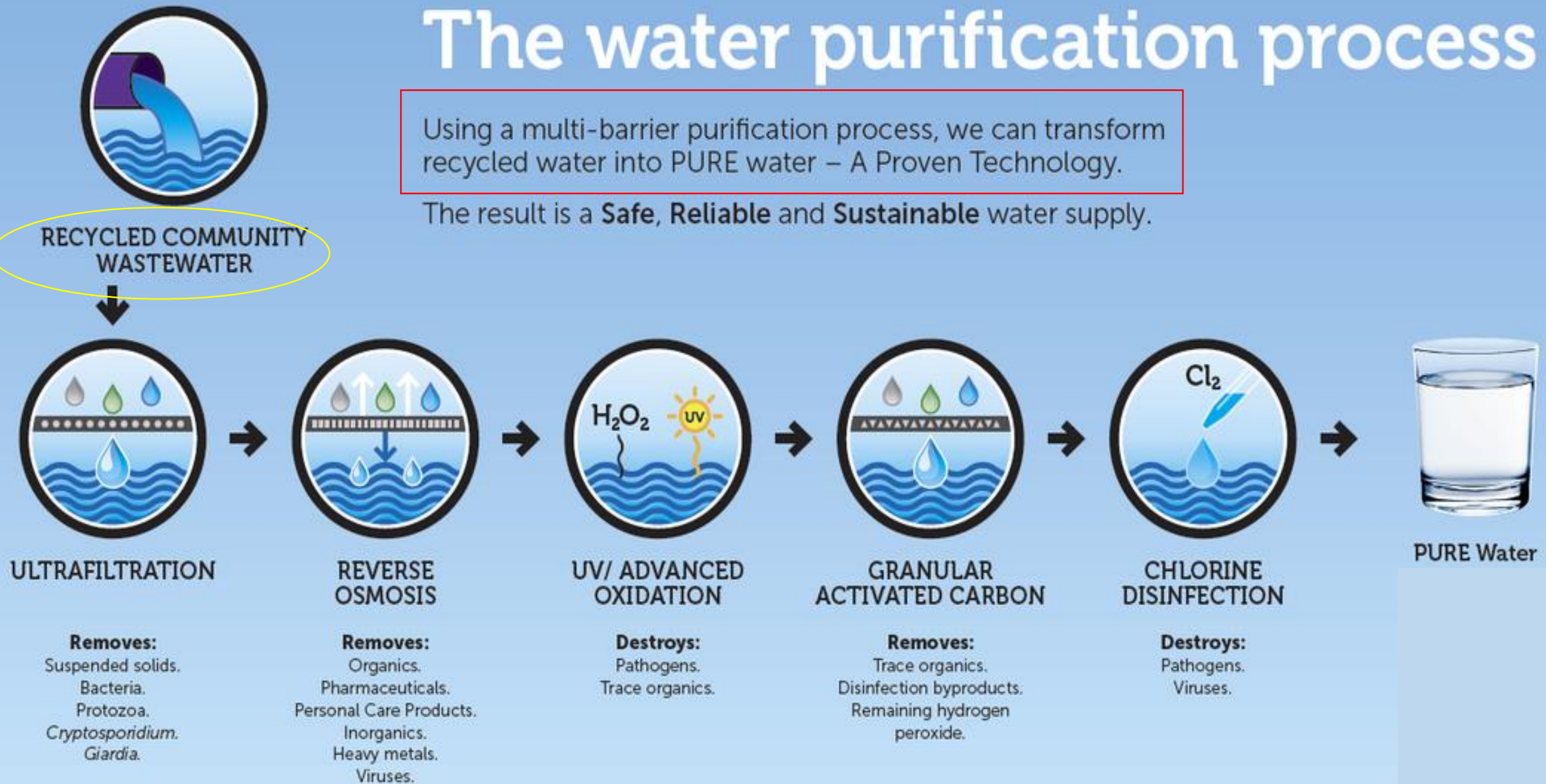
Wastewater Reuse in the world



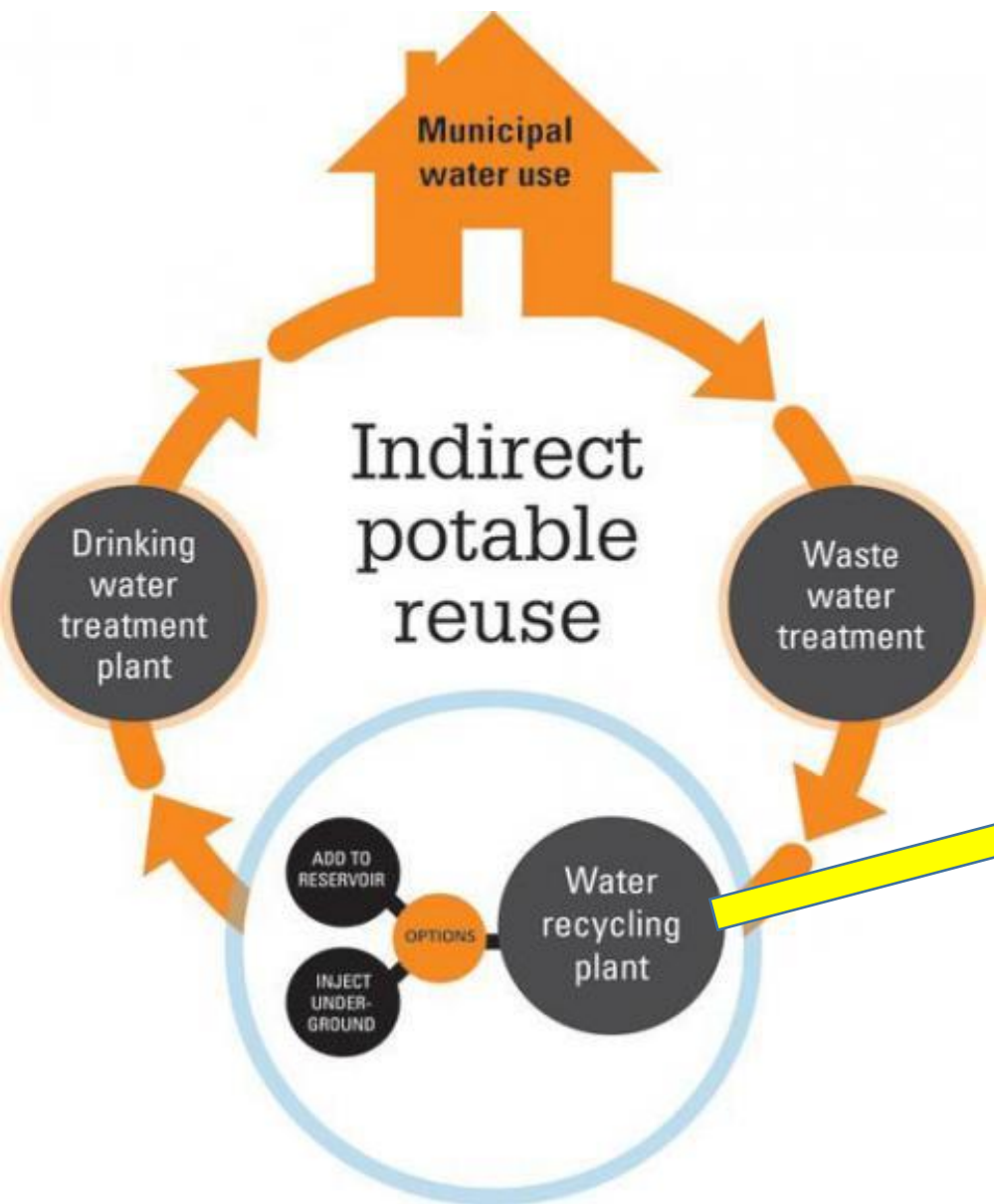
The water purification process

Using a multi-barrier purification process, we can transform recycled water into PURE water – A Proven Technology.

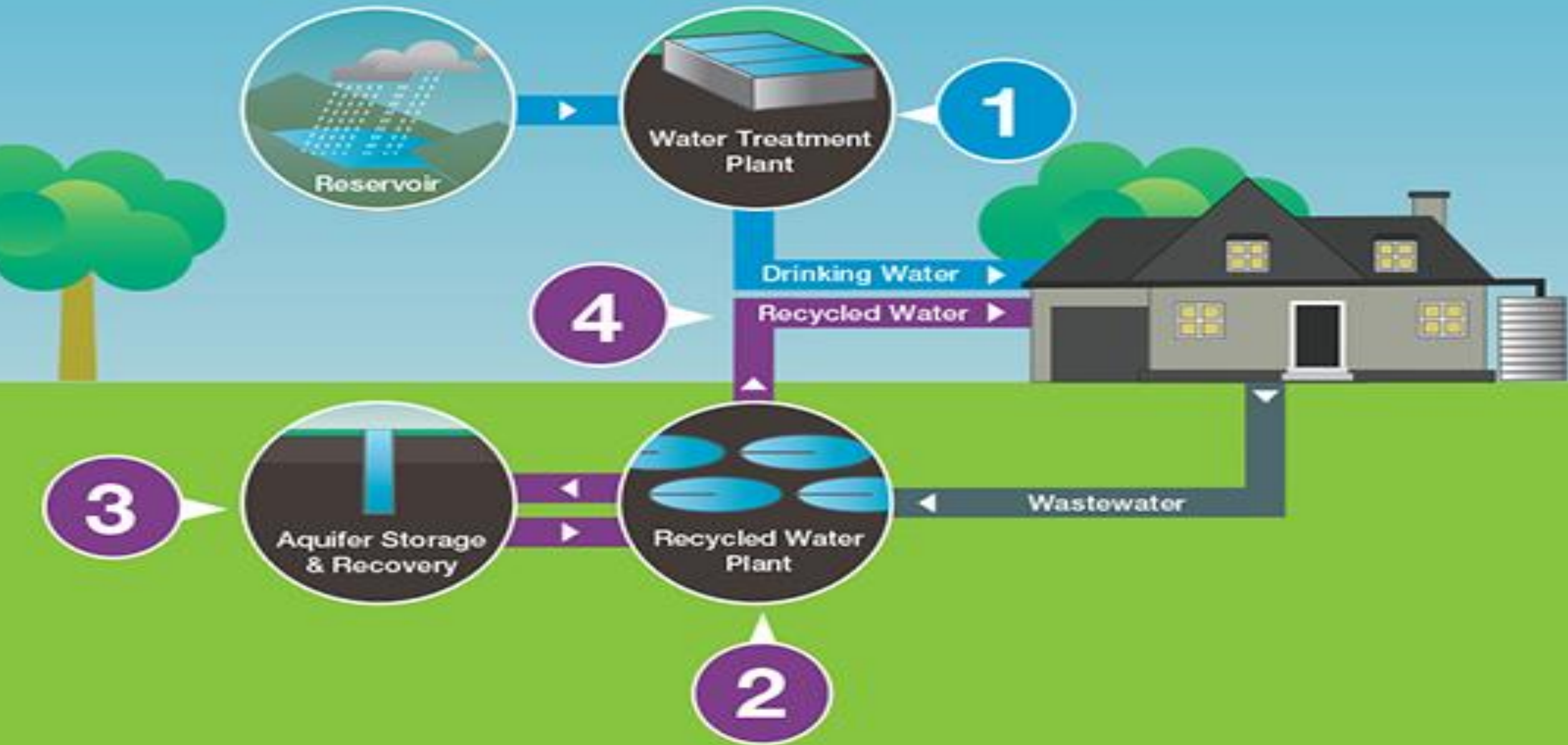
The result is a **Safe, Reliable** and **Sustainable** water supply.



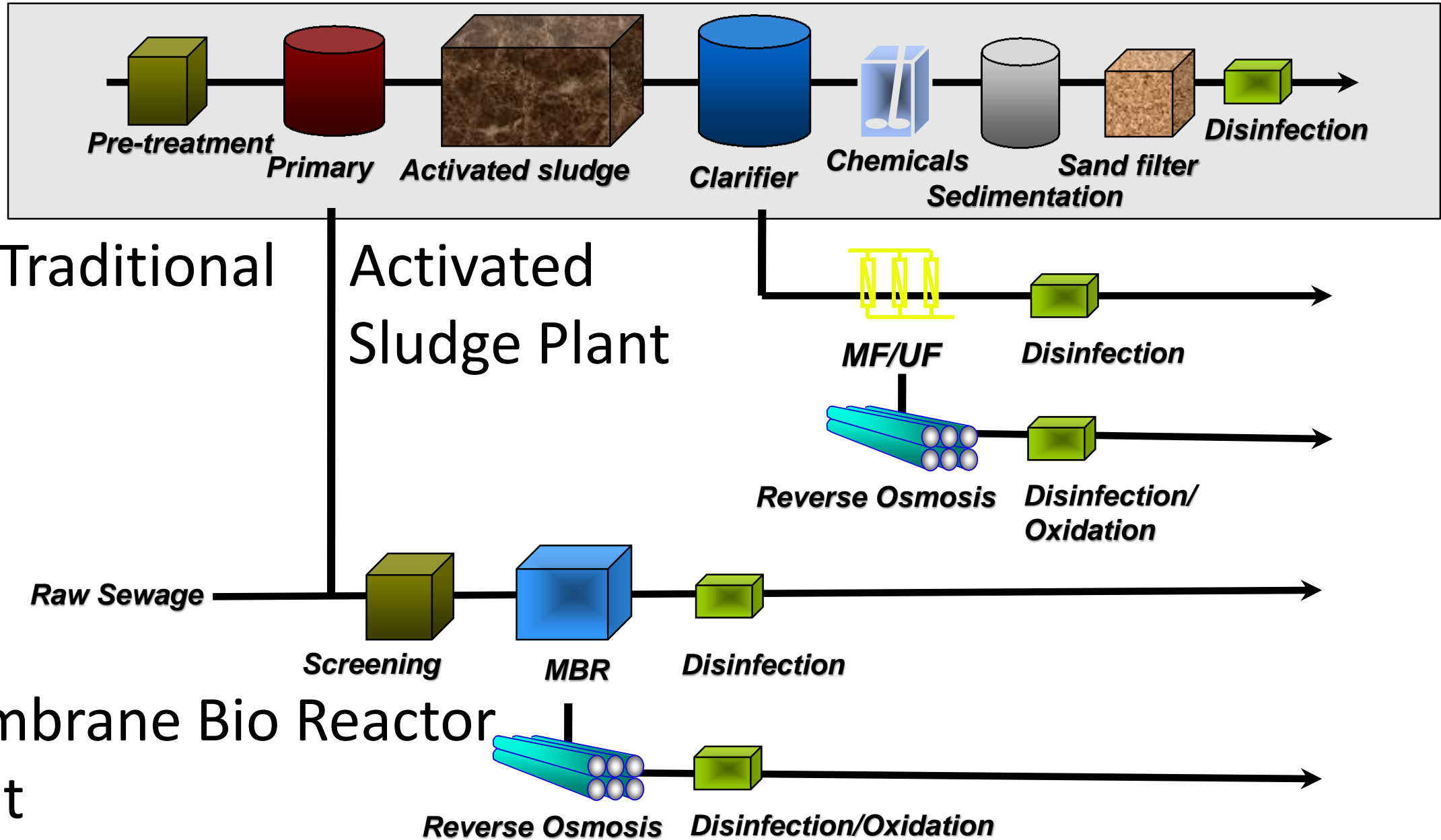
PFAS is removed through a combination of Activated Carbon and RO



How recycled water gets to your home

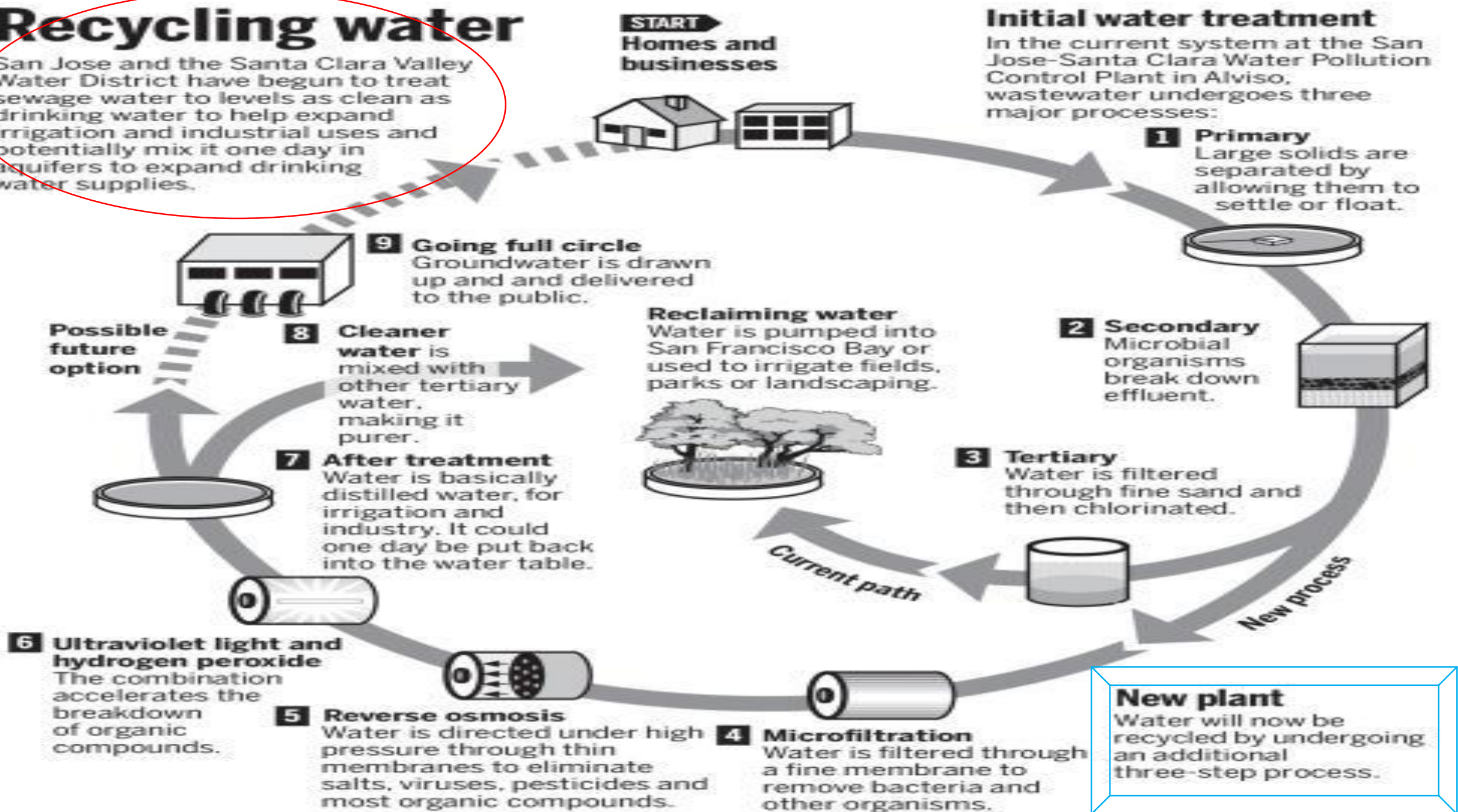


Water Reuse Treatment Trains



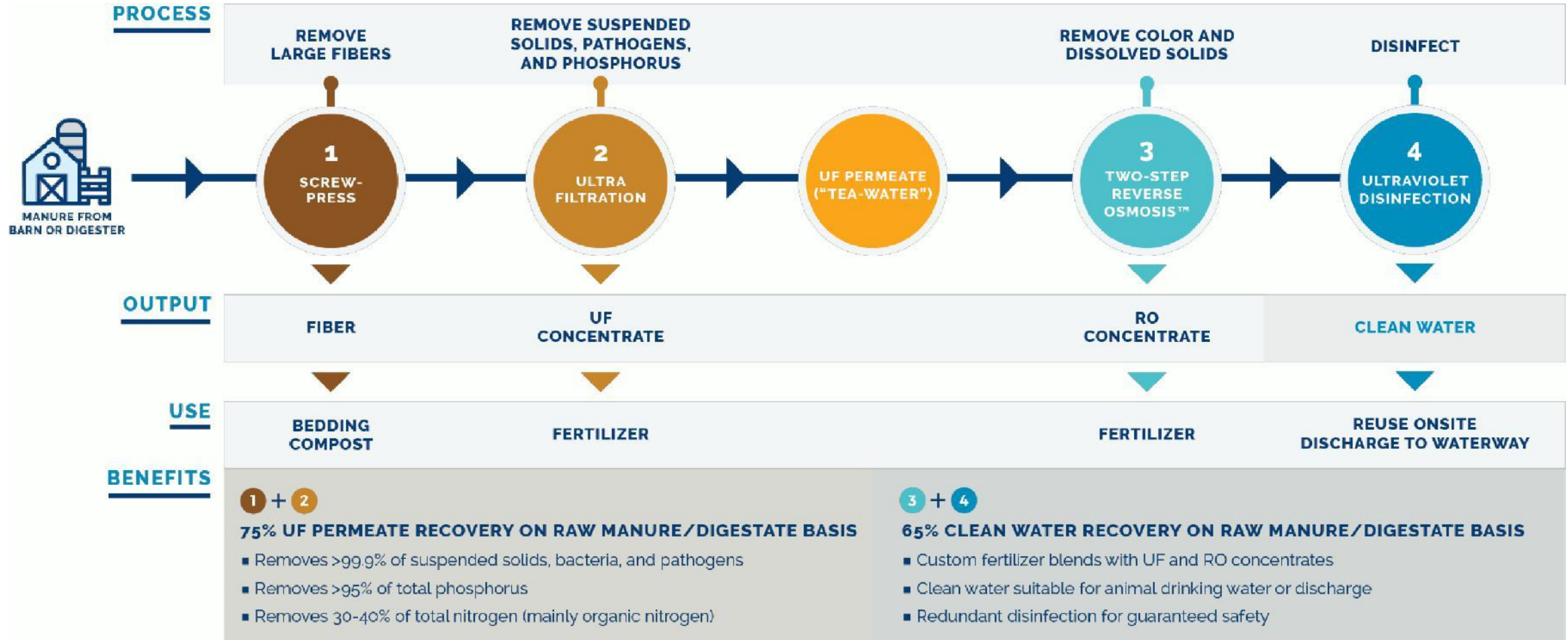
Recycling water

San Jose and the Santa Clara Valley Water District have begun to treat sewage water to levels as clean as drinking water to help expand irrigation and industrial uses and potentially mix it one day in aquifers to expand drinking water supplies.



•Nutrient Concentration & Water Reclamation™

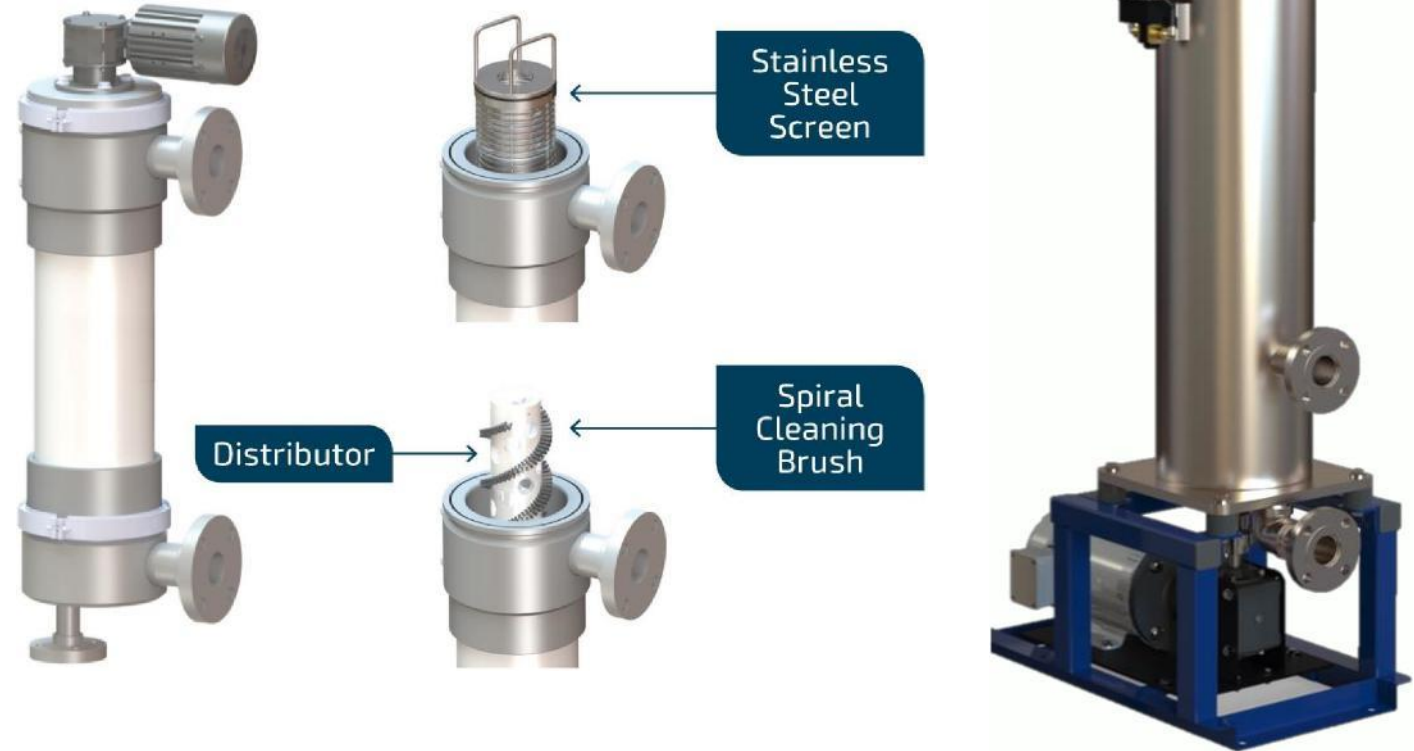
•Dairy Manure Example



•Spiral Brush Screen Filter

•High-throughput and cost-effective removal of suspended solids

- Automatic Self-Cleaning Filter
- Handles High and Variable TSS (25,000+ mg/L)
- 15 to 100 Micron Screens
- No Backwash / No Cross flow
- Continuous Filtrate with 99%+ Water Recovery
- Low Pressure Drop (<1 psi)
- Simple to Maintain
- Scalable



•Ideal for: Food and Beverage Wastewater, Dairy Flush Water, Lagoon Effluents

•Spiral Brush Screen Filtration

•Case Study: Potato Chip Manufacturer

- Starchy wastewater filtered through 15-micron screen prior to sewer discharge
- Solids purged out and sold as animal feed



•Demonstration Unit Onsite



•Purged Solids (sold as animal feed)

•Significant surcharge savings!

- 51% BOD removal
- 47% TSS removal

ULTRAFILTRATION





Digested
ORGANICS

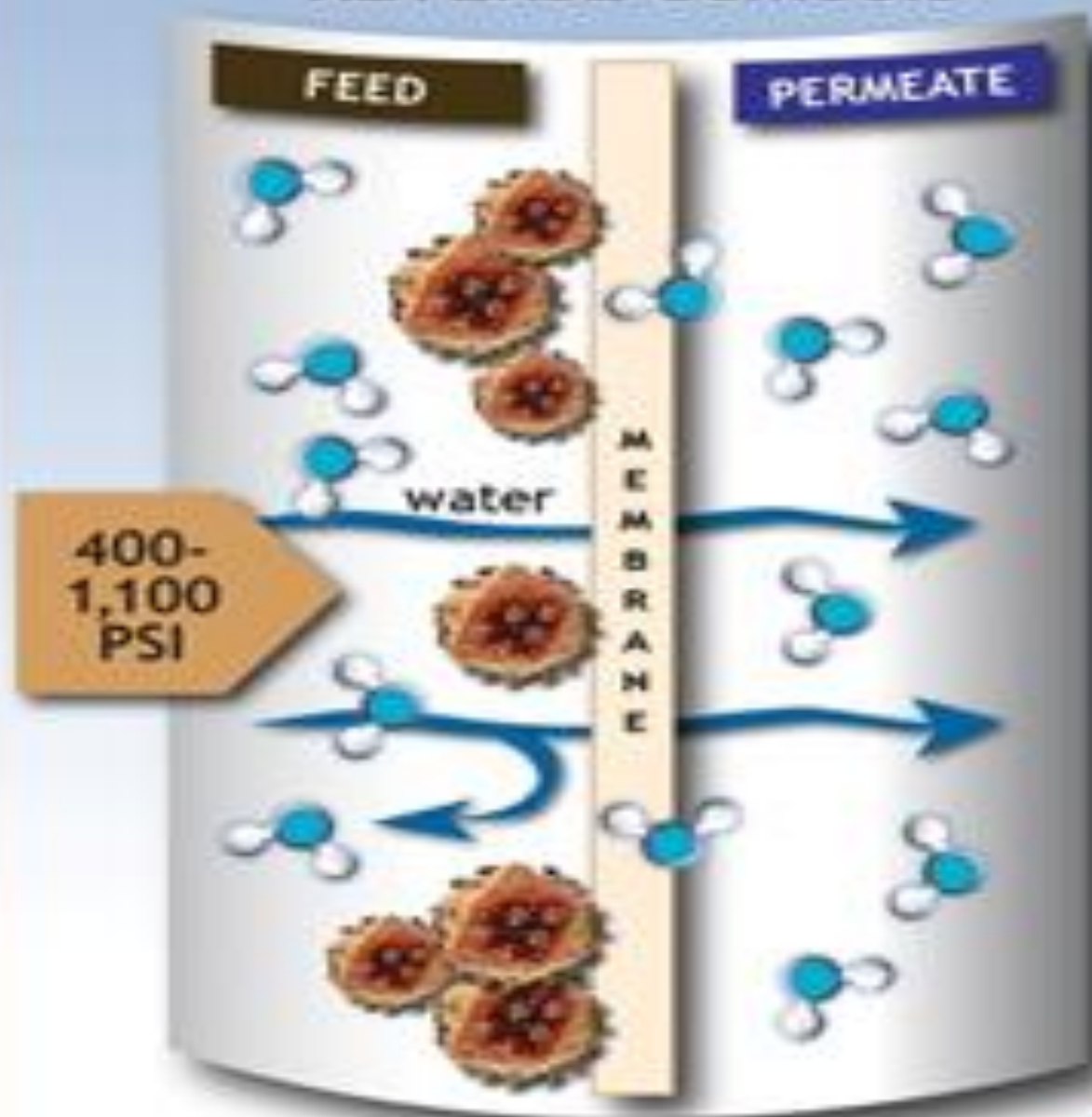
12/06/2017

Two glass beakers are placed on a reflective metal surface outdoors. The beaker on the left contains a dark, opaque liquid with a thick, white, foamy head on top. The beaker on the right contains a clear, pale yellow liquid. The background shows a bright blue sky with scattered white clouds and a green field in the distance. The beaker on the right has volume markings: 50, 100, 150, 200, 250, and 300 mL, with a '+5%' tolerance indicated near the 300 mL mark. The text '6% Solids' is overlaid in white on the dark liquid in the left beaker.


6% Solids

300 mL
+5%
250
200
150
100
50

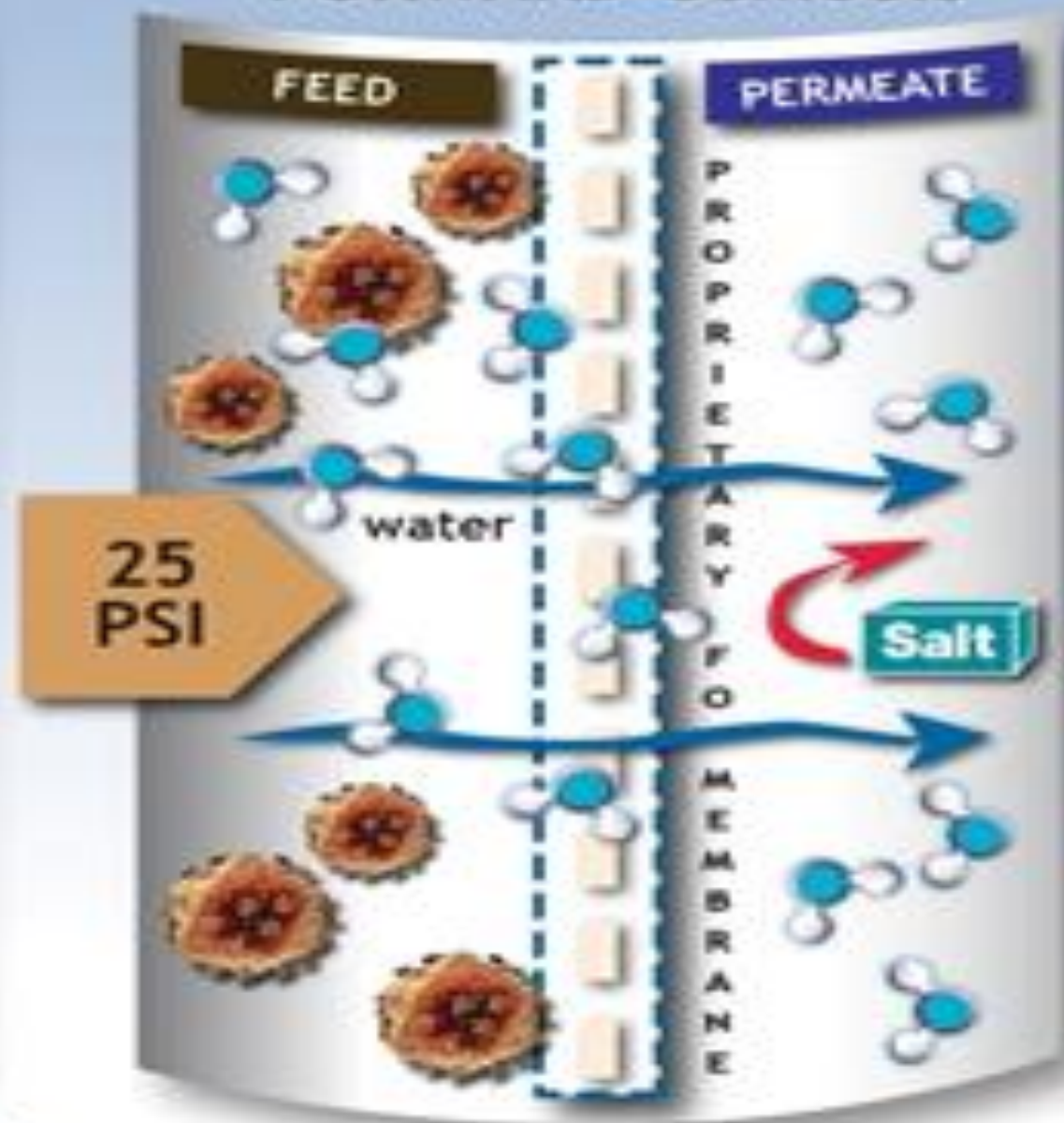
REVERSE OSMOSIS



High pressure =
high tendency to foul

 = foulant

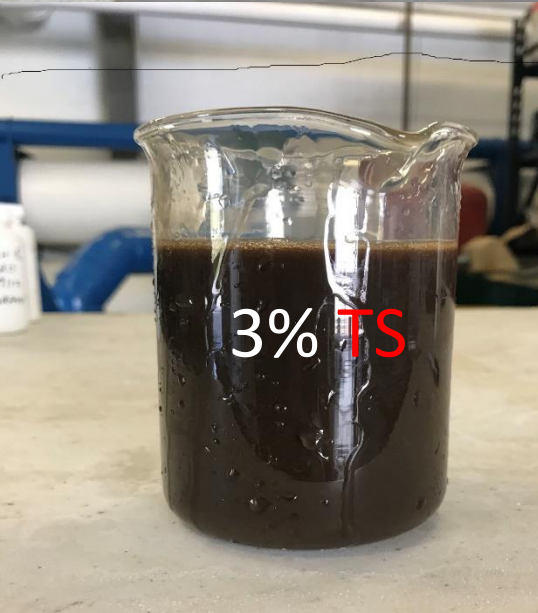
FORWARD OSMOSIS



Low pressure =
low tendency to foul



FORWARD
OSMOSIS



How urine will get us to Mars

A new recycling system turns pee into drinking water and energy **by using Forward Osmosis**

BY
ERIK
4:38P



DRINK UP Astronauts drink water made from recycled urine and other wastewater aboard the International Space Station. A new system would turn pee into drinking water and produce energy, a step toward long-term space travel

DRINK UP Astronauts drink water made from recycled urine and other wastewater aboard the International Space Station. A new system would turn pee into drinking water and produce energy, a step toward long-term space travel

Wilderness Trail Distillery to Install Stillage Filtration System



•Two-Step Reverse Osmosis™

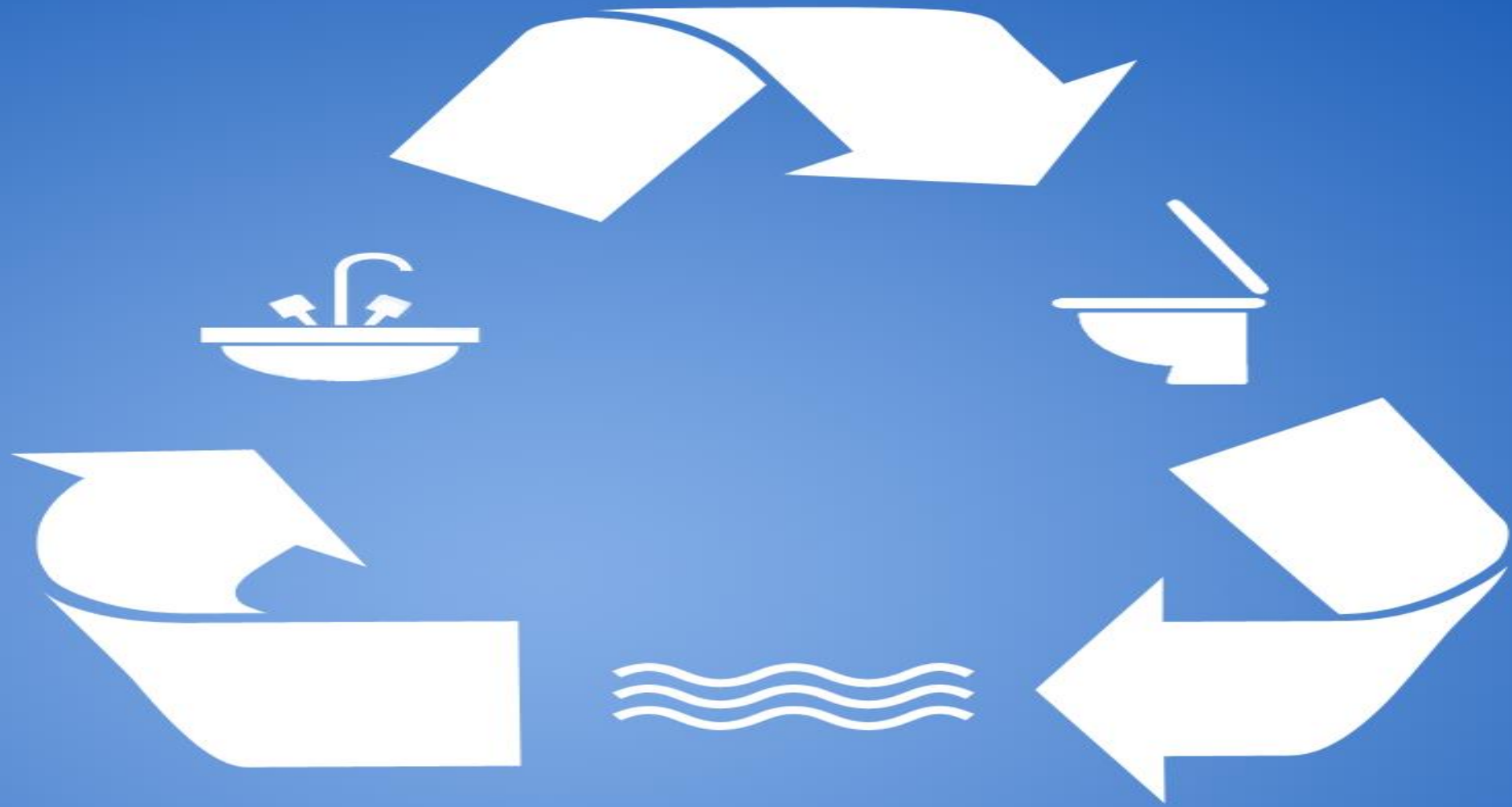
- Concentration and water reclamation in a non-biological, compact system



Food and Beverage Wastewater



Ultrafiltered Dairy Manure



WATER REUSE SYSTEM
WATER WILL GO FROM WASHING YOUR HANDS, INTO YOUR TOILET, GARDEN, ETC.



One Method ? OR



62 ACRES UNDER ROOF

Stork Cooker using
cooling water

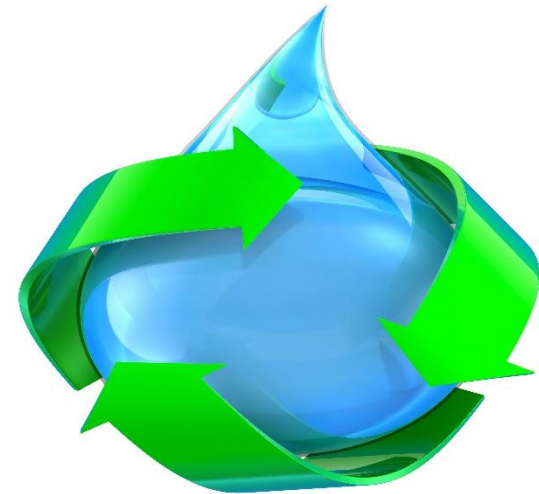
H₂O Plant



MAUMEE RIVER

Some opportunities for water reuse in an industrial plant may include:

- Wastewater recycling
- Cooling tower blowdown
- Boiler blowdown
- RO reject recovery and reuse
- Once through cooling water
- Collected rain waters



Guess – How Many Gallons of Water to make a case of Chicken Noodle Soup

48 cans / case



10 – 11 ounces

$$48 \text{ cans} \times 10.5 \text{ oz.} = 504 \text{ oz.}$$

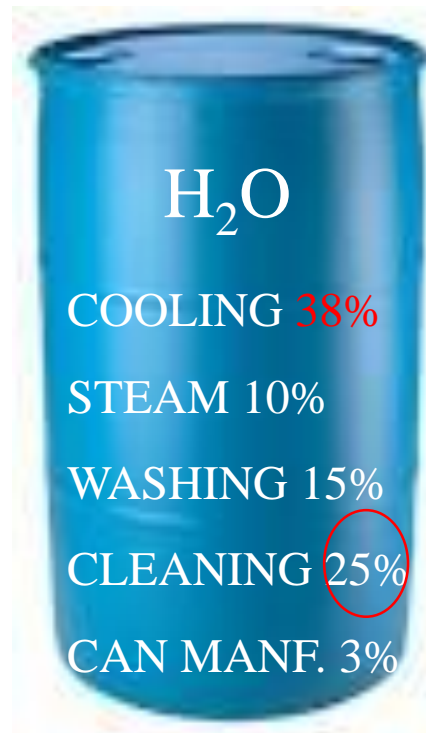
$$504 \text{ oz.} / 128 \text{ oz.} =$$

3.94 gallons

ARE YOU SURE ?



It Takes 42 Gallons to make one case of soup



COOLING COMPRESSORS 7%

WATER IN CANS & BOTTLES 2%

?





Consider High Pressure Low Water Volume for Cleaning

Speaking of Recycling !!!

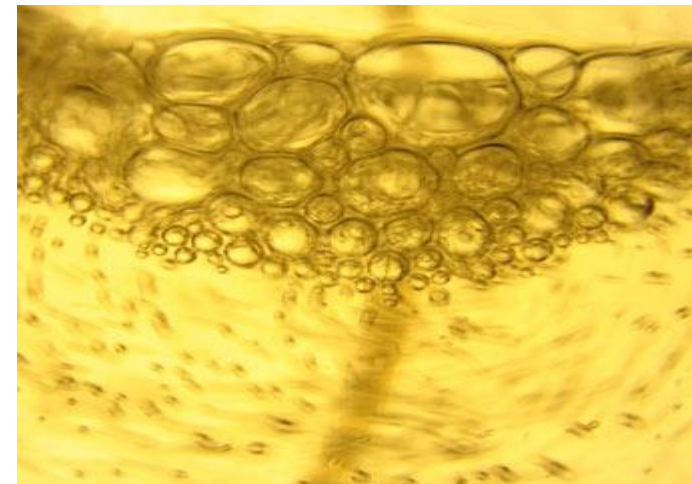
Our bodies are not **100%** efficient at converting food energy into mechanical output. But at **about 25% efficiency**, we're surprisingly good considering that most cars are **around 20%**, and that an Iowa cornfield is only about **1.5%** efficient at converting incoming sunlight into chemical storage.

Where does the other 75% Go???

Americans use 5.7 billion gallons per day from toilet flushes.



REMEMBER THEY CAN'T
FL__H
WITHOUT
US



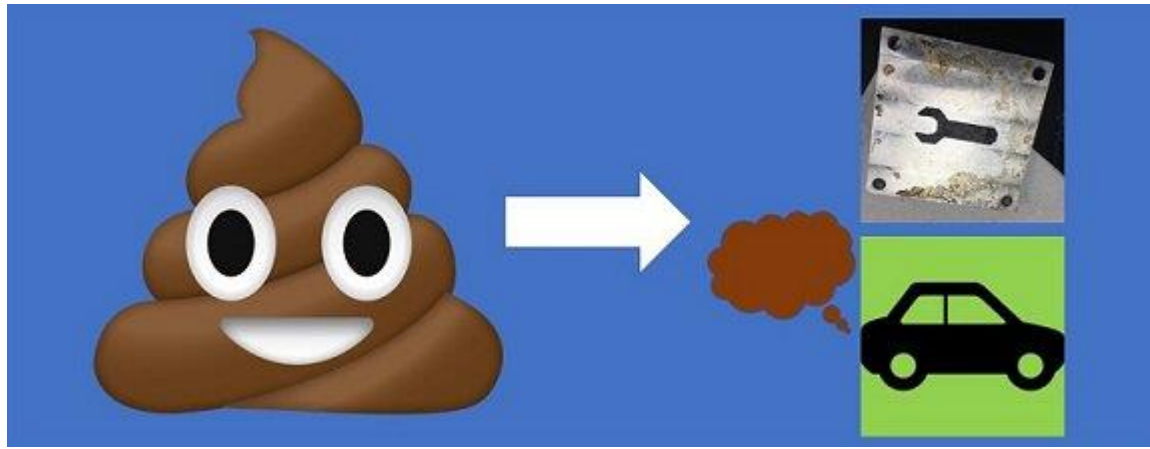
The daily amount of our poop weighs at least 25 grams out of which 7.5 grams are carbohydrates. According to biochemistry, one gram of carbohydrates produces 14.2 kilojoules of energy. Therefore, 7.5 grams of poop will yield 106.5 kilojoules of energy .

SO



=

100.5 BTU'S



=



In fact, poop is becoming so valuable as a commodity, that South Korea's government invested \$8.7 million in virtual currency that would [pay people to poop for biofuels](#), as reported in the *Digest* in March. People there will [get paid](#) the equivalent of **43 cents** every time they use the new waterless toilet developed by the Ulsan National Institute of Science and Technology that turns human waste directly into biofuel. Hope is that by 2020, the value of the currency will have increased so that every poop "donation" is worth about **\$3.12**



Waterless Compost Toilet

It only gets better



- Besides, Prof. Cho has developed a *smartphone* application that can determine the monetary value of the human excrement.
- Using this application, people can soon trade their waste for a virtual or digital currency to use.
- At the pavilion, the team plans to expand into selling salads made with barley sprouts, which can only be purchased with such virtual currency.

Sprout Salad

Arish Dagari
PHOTOGRAPHY



==



Think About The NEXT TIME YOU EAT OUT



HEY, I CAN GET THE
Big Mac !!!

YOU HEARD OF NIKE ???



HOW ABOUT THE

MI – KE

Pronounced:

(My) (Key)

THE RECYCLED SHOE !!!

????????????

A single liter of bottled water takes a staggering 3 liters of water just to produce the bottle, fill it up and now you are talking about a 4 to 1 ratio.

It takes 2,257 gals. To make a pair of shoes

MI - KE

MI - KE



How do you make rocket fuel from

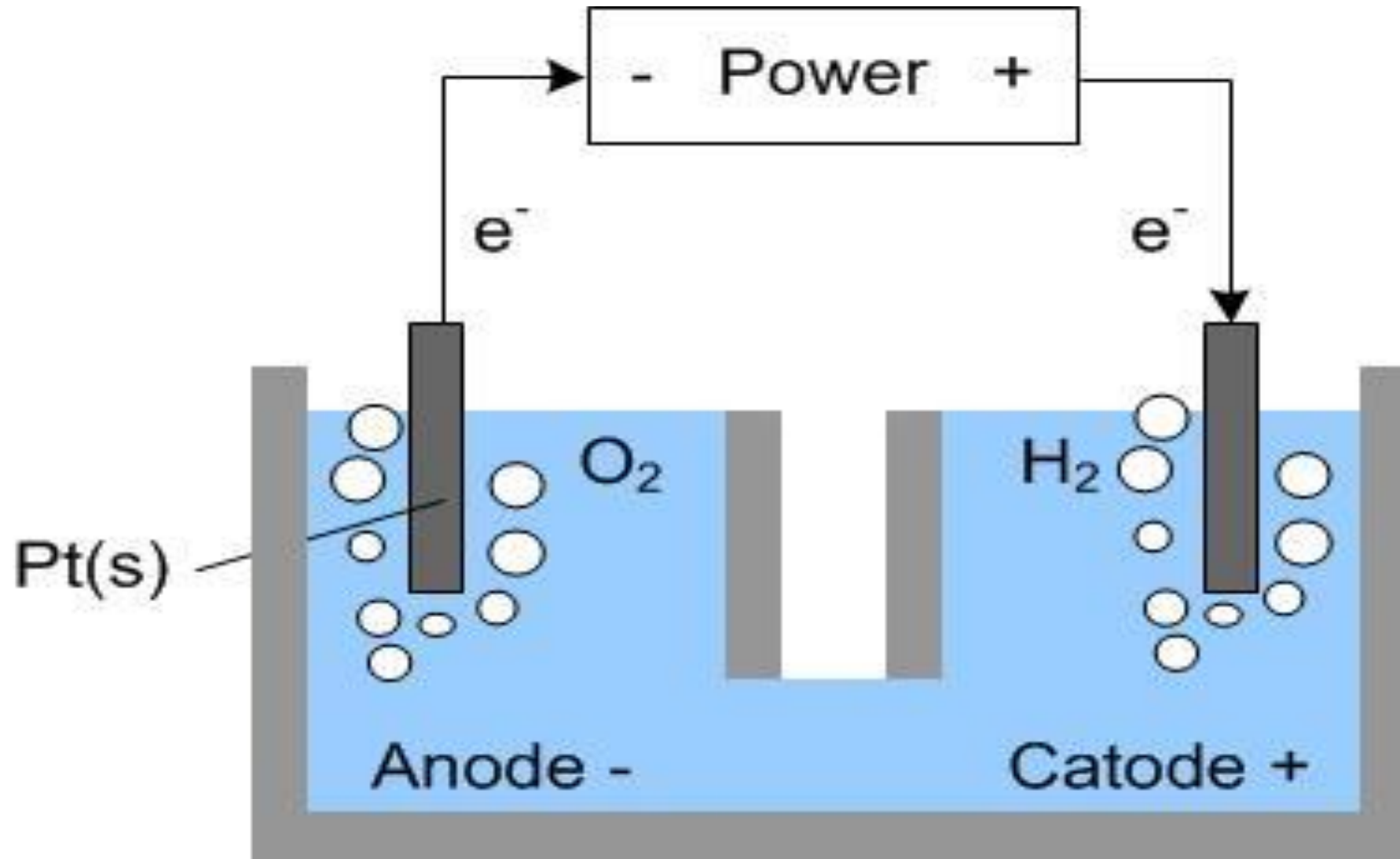


NASA Will Launch a Lunar VIPER to Hunt Moon Water in 2022



It's all about water **electrolysis**, a technique that uses an electric current (in space, from solar panels) to break down compounds and convert them into something else. In this case, hydrogen fuel.


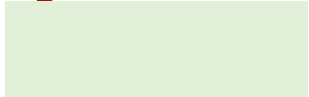
Hey Operators let's make some Rocket fuel



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How much of the human body is made of **water**?

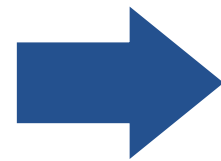
a. 10%

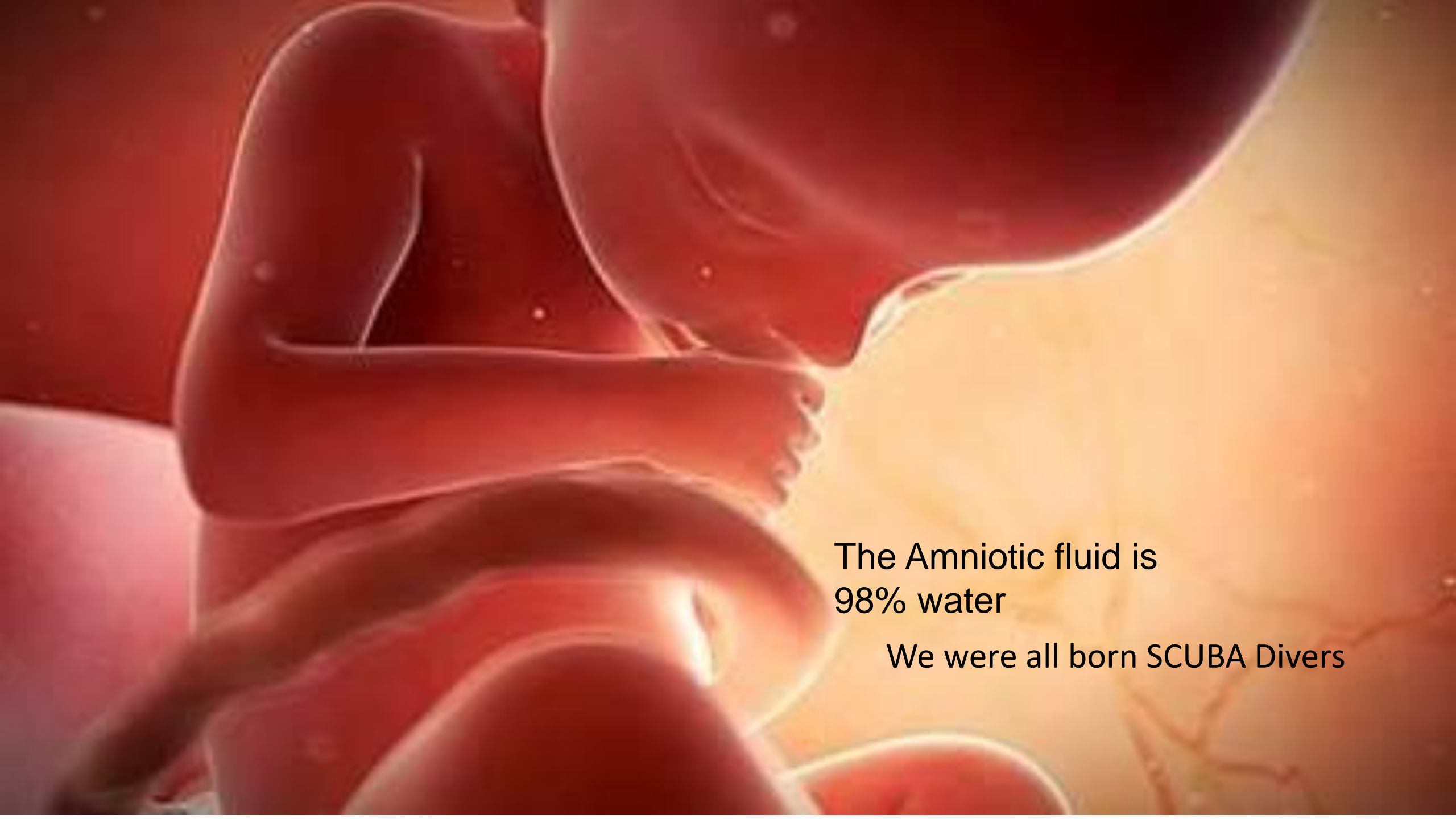
b. 50%

c. 70%



CORRECT!
The human body
is made of nearly
70% water.

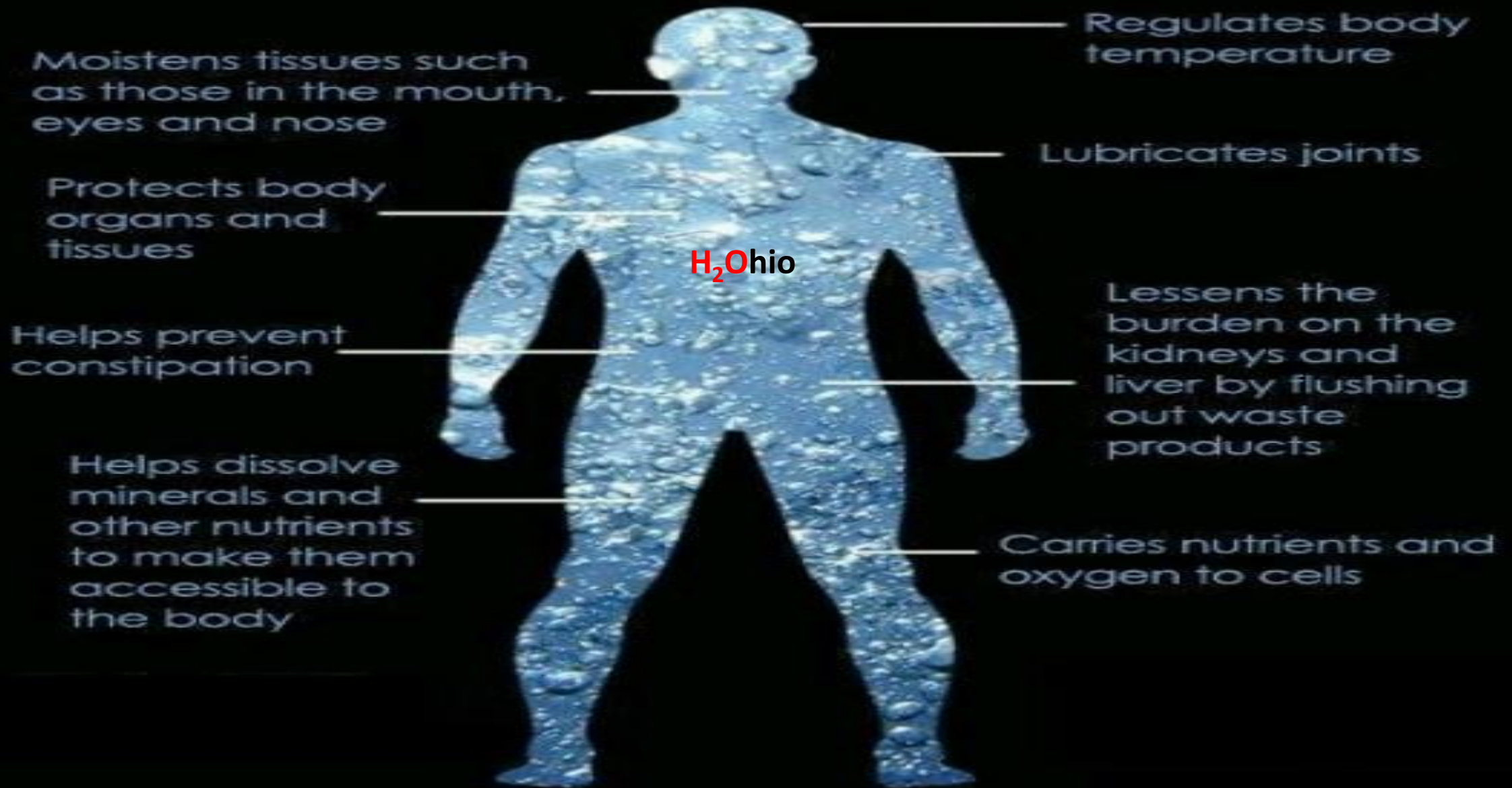




The Amniotic fluid is
98% water

We were all born SCUBA Divers

Water's effect on the Body



How Much Water is in Your Body?

Your Body Weight (lbs) x 70% (or 76% for an infant) = lbs. of water in your body

To convert lbs. to gallons just divide by 8.34!

So for example: $175 \times 0.7 = 122.5$ lbs. of water or 14.6 gallons

Our Demand for Water **Did YOU KNOW ?**



It takes 5,670 litres (1,500 gal) of water to process one barrel of beer

454 litres (120 gal) of water are used to produce one egg



It takes 45 litres (12 gal) of water to process one chicken



147,000 litres (39,000 gal) of water are used to manufacture one new car




About 25,700 litres (6,800 gal) of water is required to grow a day's food for a family of 4

It takes 7,000 litres (1,850 gal) of water to refine one barrel of crude oil

Maybe You Should Start Talking To Your Water

I recently watched this wonderful documentary that scientifically explains how water takes on the energy found in its surroundings. I have actually started talking to my water and infusing it with transforming energy. Scientist have taken samples of water and said words like "love" and "hate" and "Hitler". They then freeze the water and analyze the crystals.

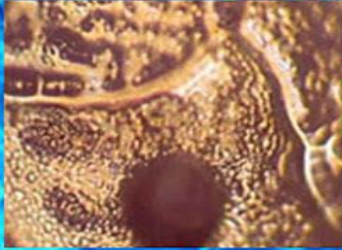
The water that received positive affirmations has beautiful snowflake like crystals and the energy is heightened. The water exposed to the negative messages formed misshapes, ugly broken crystals and this happens every time.



Dr. Masaru Emoto's

Water

Experiment



polluted water
Yodo River, Japan



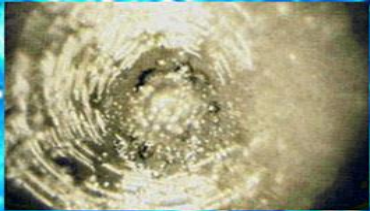
Fujiwara Dam Water
BEFORE prayer



Fujiwara Dam Water
AFTER Prayer



spring water
Yusui Mountain Spring, Japan



you fool



heavy metal music



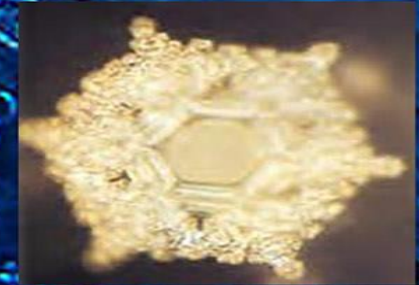
Beethoven's music
Pastoral



thank you



you make me sick



love & appreciation

Water Crystals as photographed
by Dr. Masaru Emoto

Water Has Memory

Research from
the Aerospace Institute, Stuttgart, Germany



REMEMBER THE
BRAIN IS 75%
WATER



Maybe the loss of
memory is due to a
lack of water !

- Toilet to tap feasible – biggest hurdle is public perception

**THANK YOU
OPERATORS
FOR CHANGING THE
PERCEPTION**



SANTA CLAUSE IS

COMING TO TOWN





WISHING YOU AND YOUR FAMILY

A

HAPPY HOLIDAY SEASON

Happy Holidays from Mike Maringer

OTCO – B12843 - OM

WATER RECYCLING AND REUSE

THANK - YOU

