NOVEMBER 2022

Antiscalant Slow Release Tablets

Juan Pablo Camezzana

DISTRIBUTOR SUMMIT

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Piedmont GENESYS PWT™

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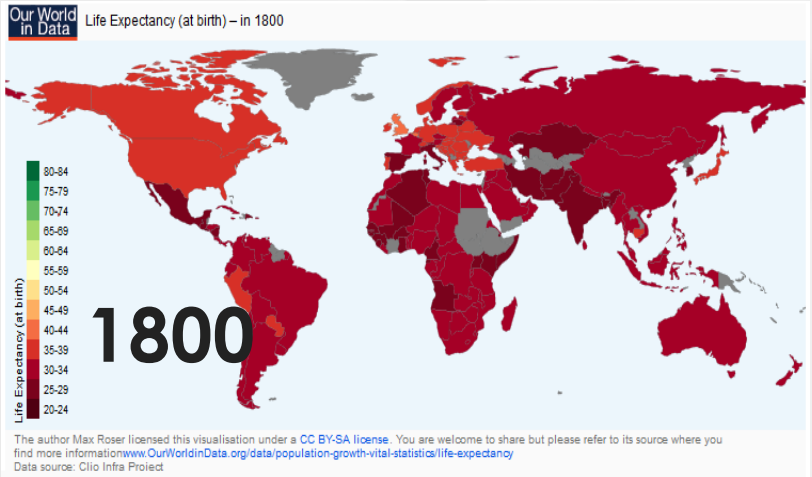
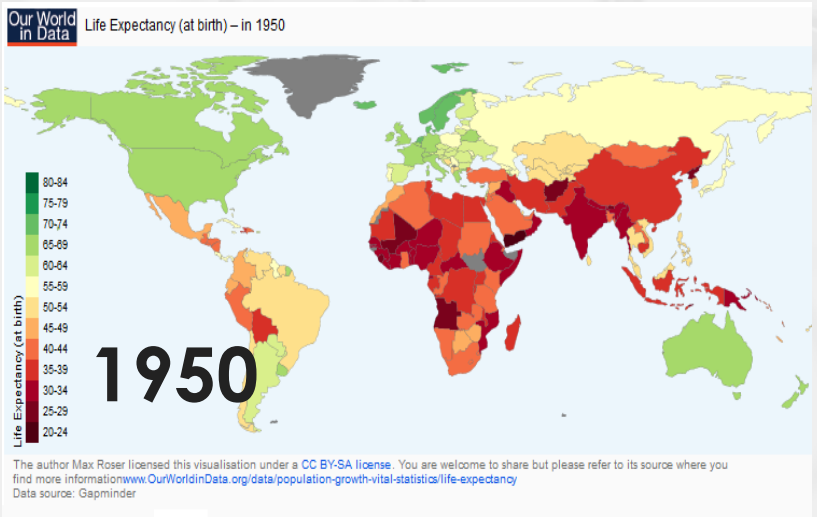
NOVEMBER 13-17, 2022

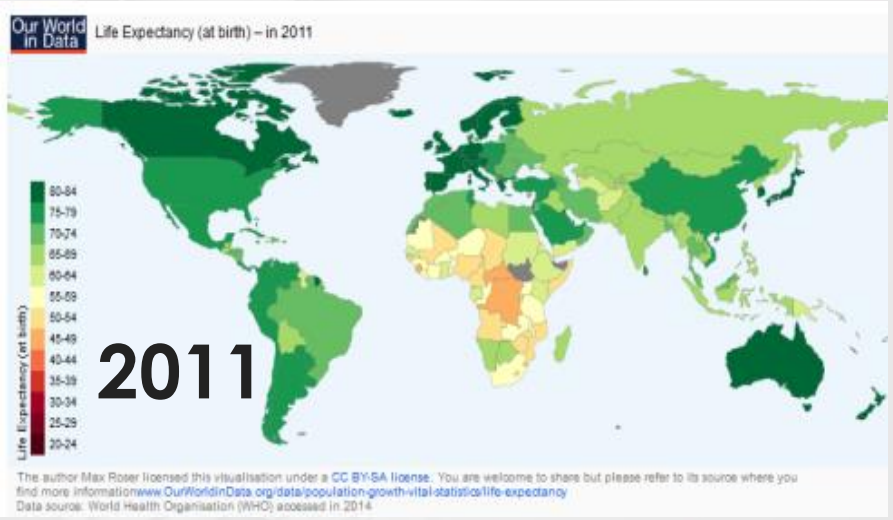
Introduction

- The Point Of Use (POU) Reverse Osmosis (RO) systems market has been growing at a rapid pace globally, especially in China and India where there is a **high demand for high quality drinking water.**
- The **quality of municipal tap water can vary** seasonally and cause variations in temperature and total dissolved solids (TDS).
- The **emergence of micro-contaminants** and deteriorating supply lines **has created a demand for POU RO** systems where conventional treatment is not sufficient to provide safe drinking water.

Life Expectancy







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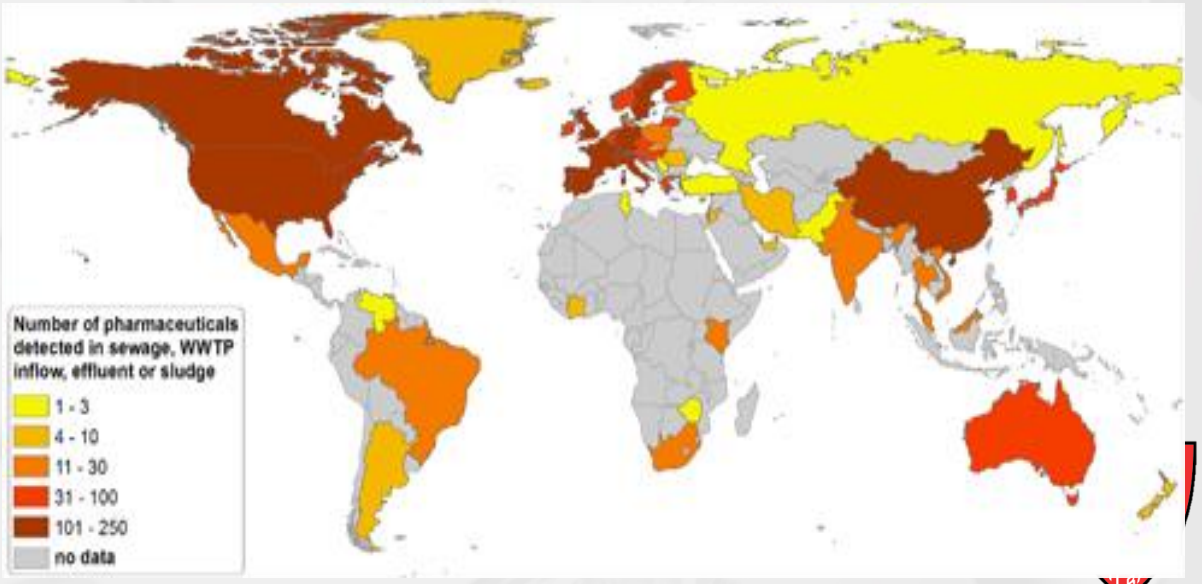
#Pharma in Sewage



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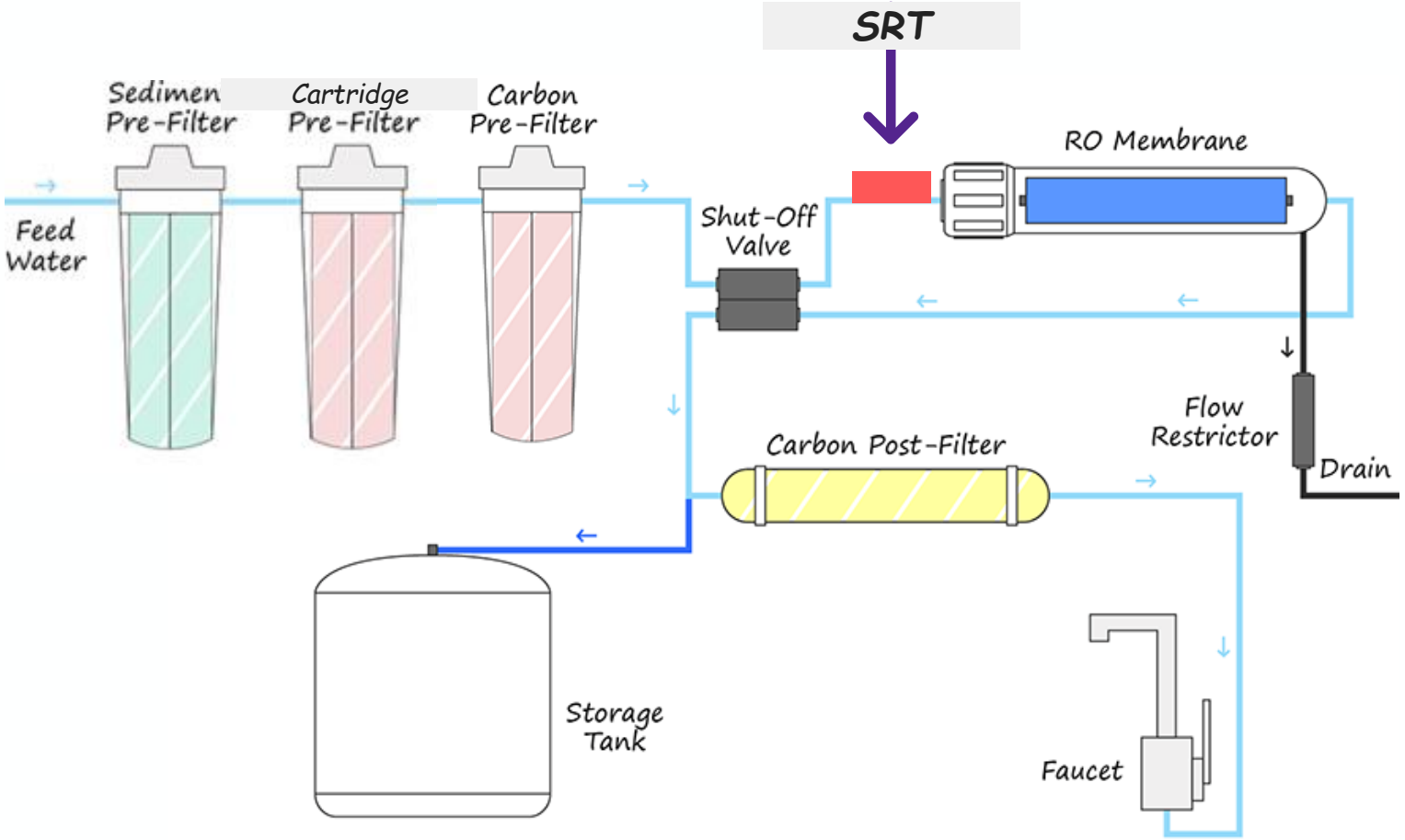
- The **emergence of micro-contaminants** and deteriorating supply lines **has created a demand for POU RO** systems where conventional treatment is not sufficient to provide safe drinking water.
- **Underground aquifers** in urban/rural regions **have been affected by the anthropic actions** and Nitrates levels have rise above the potable water limits.
- The hardness in water can cause the RO membranes to scale, consequently lowering the flow across the membrane.
- Particles and sediment can cause premature fouling of the RO membrane.
- **Dosing liquid antiscalant is not practical for this application.**
- **Antiscalants, in a Slow Release Tablet (SRT) form, could be used for controlling scale formation in POU RO systems.**

Example Installation

- Can be placed before the RO inside a filter housing
- Can be dropped inside a cartridge pre-filter



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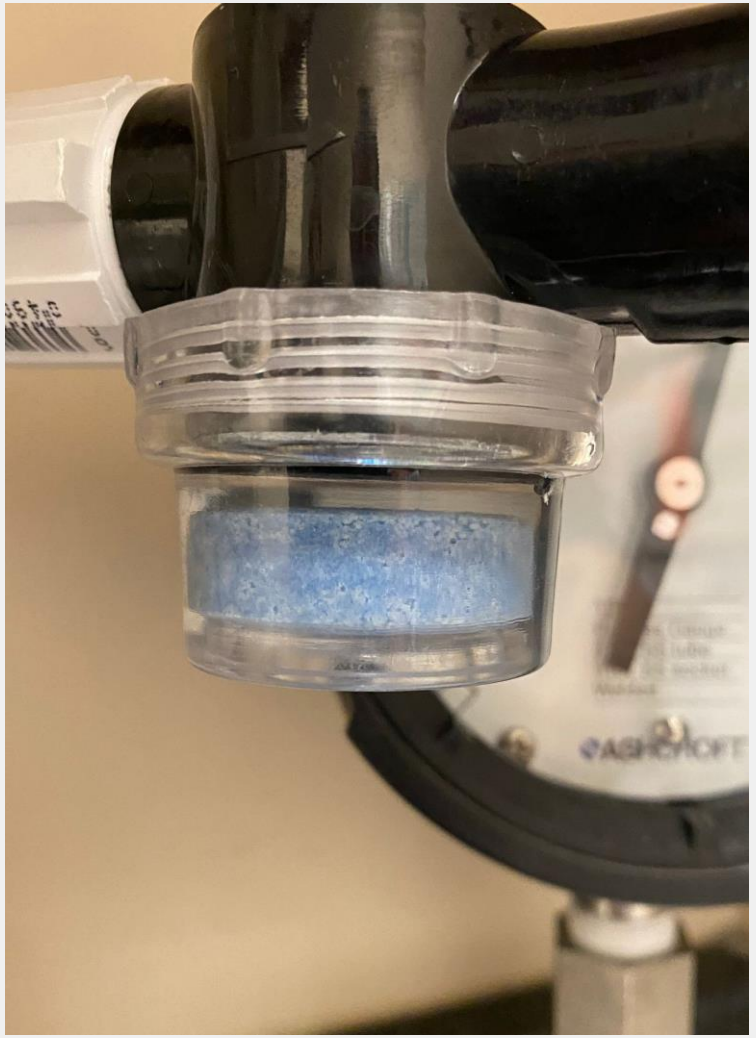

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- Did you know that a product named Antiscalant Slow Release Tablets exist in the market?

- Did you know that PWT was working developing a sustainable Antiscalant Slow Release Tablets?

Development Inspired in Sustainability

SpectraGuard™ 111
CONCENTRATED, LIQUID REVERSE OSMOSIS ANTISCALANT

Titan ASD™ 200 SC
CONCENTRATED, LIQUID REVERSE OSMOSIS ANTISCALANT

Dendrimer Synthesized by PWT in Vista - USA and soon in Cheshire - UK

- **Superconcentrated (x11)**
- **Phosphate-free** formulation
- High reactivity due to **abundance of accessible functional groups and dendritic voids**
- Classified as **non-hazardous** (and Low Toxicity)
- Low Polydispersity ratio (**high Purity**)
- **High Chemical Stability** and Structural Integrity
- **NSF** Approval.

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If each POU RO recovery rate could be optimized, **SRT would have a massive effect in terms of water efficiencies.**

Also, **without increasing the eutrophication risks** of aquifers, because of our dendrimer molecule 100% phosphorous free.

Definitely, a Sustainable Solution for an existing problem.

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Development Challenges

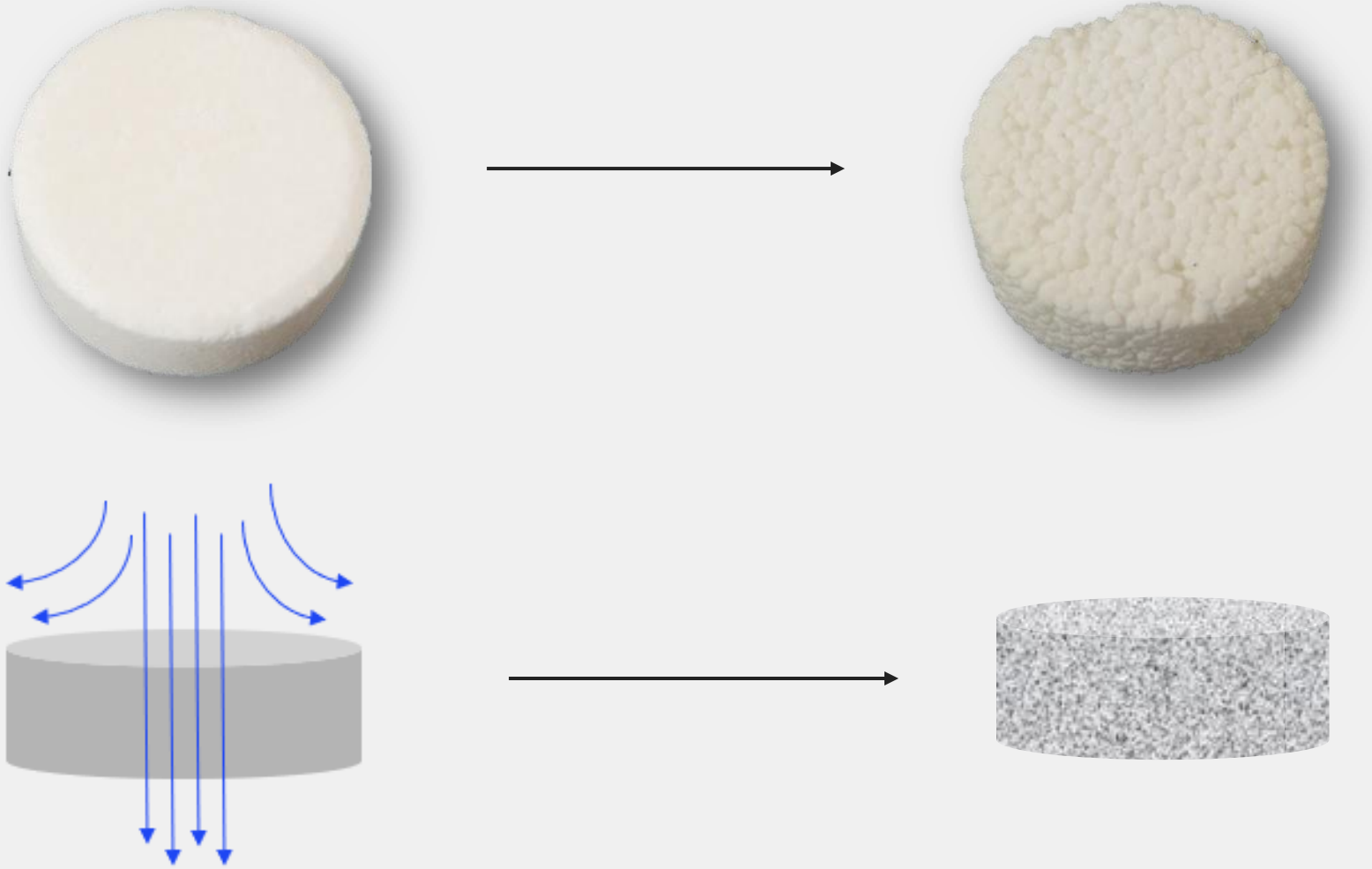
Slow Release	**Dendrimer is water soluble. Developing formulation that controls dissolution rates of dendrimer.**
Drying Dendrimer	**Dendrimer is hygroscopic and dry powder becomes sticky when exposed to humidity**
Competition	**Existing products based on basic commonly available phosphate technology (SiliPhos)**

Development Timeline

SRT 1 **Oct 2019**	• Neutralized Dendrimer • High release rates
SRT 2 **Mar 2020**	• Introduced inert rate controlling additive • Poor tablet form retention
SRT 3 **July 2020**	• Calcium Phosphate inert material • Release rates of a few hours only
SRT 4 **Sept 2020**	• Increased tablet compaction - Switched inert material • Release rate increased to a few days
SRT 5 **Dec 2020**	• Increased dendrimer loading to 20% • Extended tablet life
SRT 6 **Feb 2021**	• Dye added to indicate dendrimer release • Confirmed improved RO membrane life of POU RO (50 GPD)
SRT 7 **Apr 2021**	• Lower dye loading to match dendrimer release • Samples sent to PWT China for testing
SRT 8 **July 2021**	• Increased dendrimer concetration to 40% • Testing restarted with POU RO (50 GPD)
SRT 9 **Oct 2021**	• Stacking tablets for extending release rates confirmed • Testing with 600 GPD system to achieve 10,000L life span
SRT 10 **Dec 2021**	• Increased compaction density for extending SRT life • Samples shipped to PWT China for testing

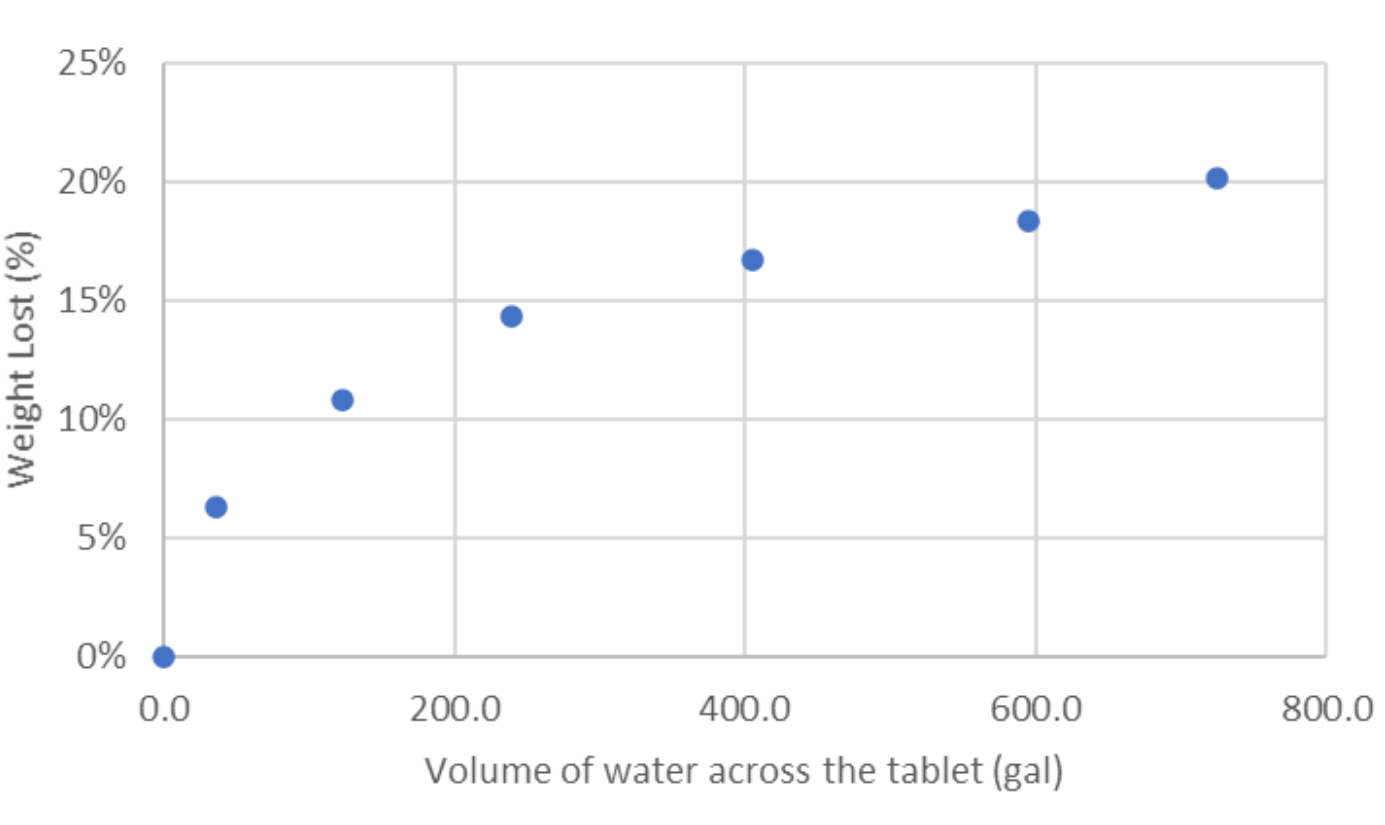
Slow-Release Antiscalant Mechanism

Active material embedded inside inert material



Flow of water has a tortuous path that controls release rate

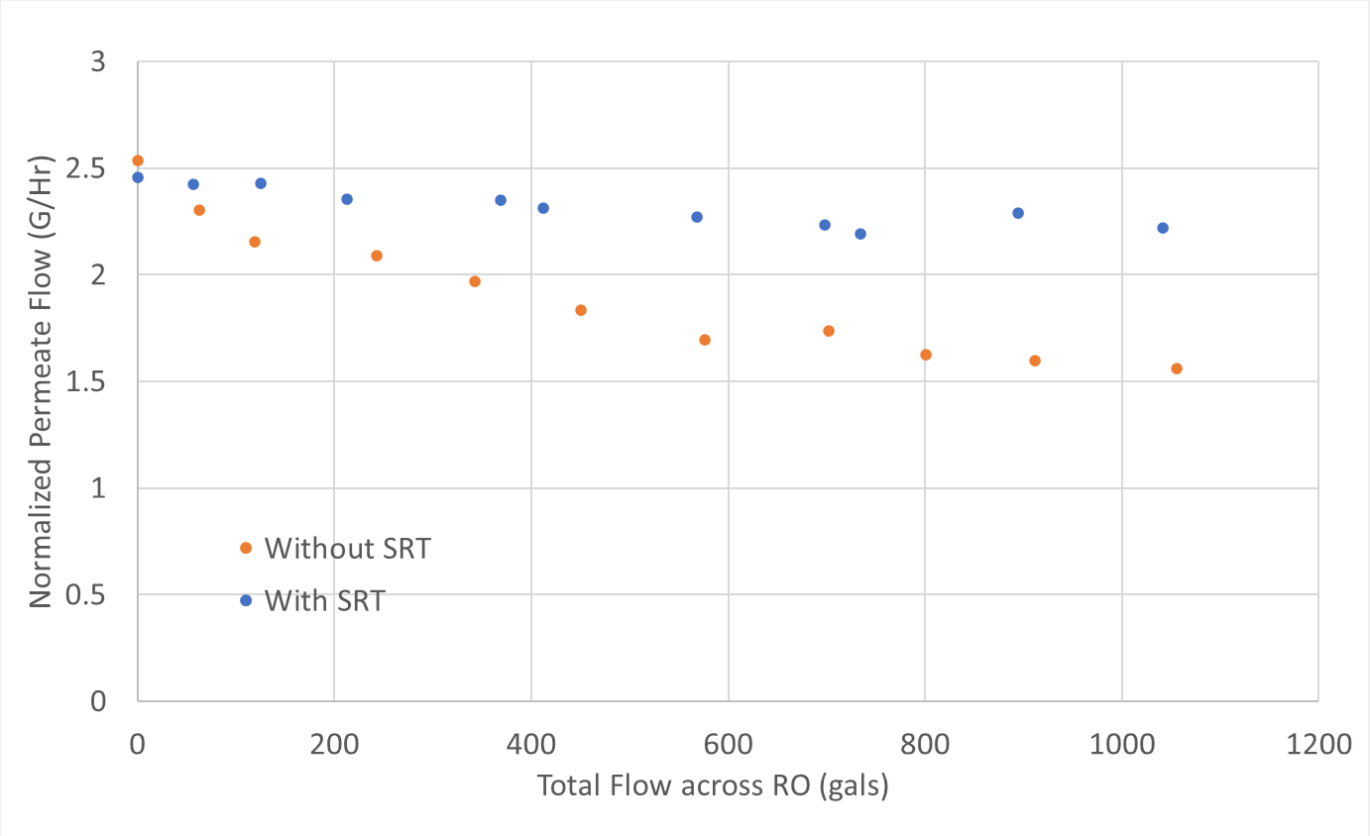
Antiscalant Release Rates



20% active material @ 5 GPD (average flow, under the sink RO) current tablet will last >45 days

RO performance comparison

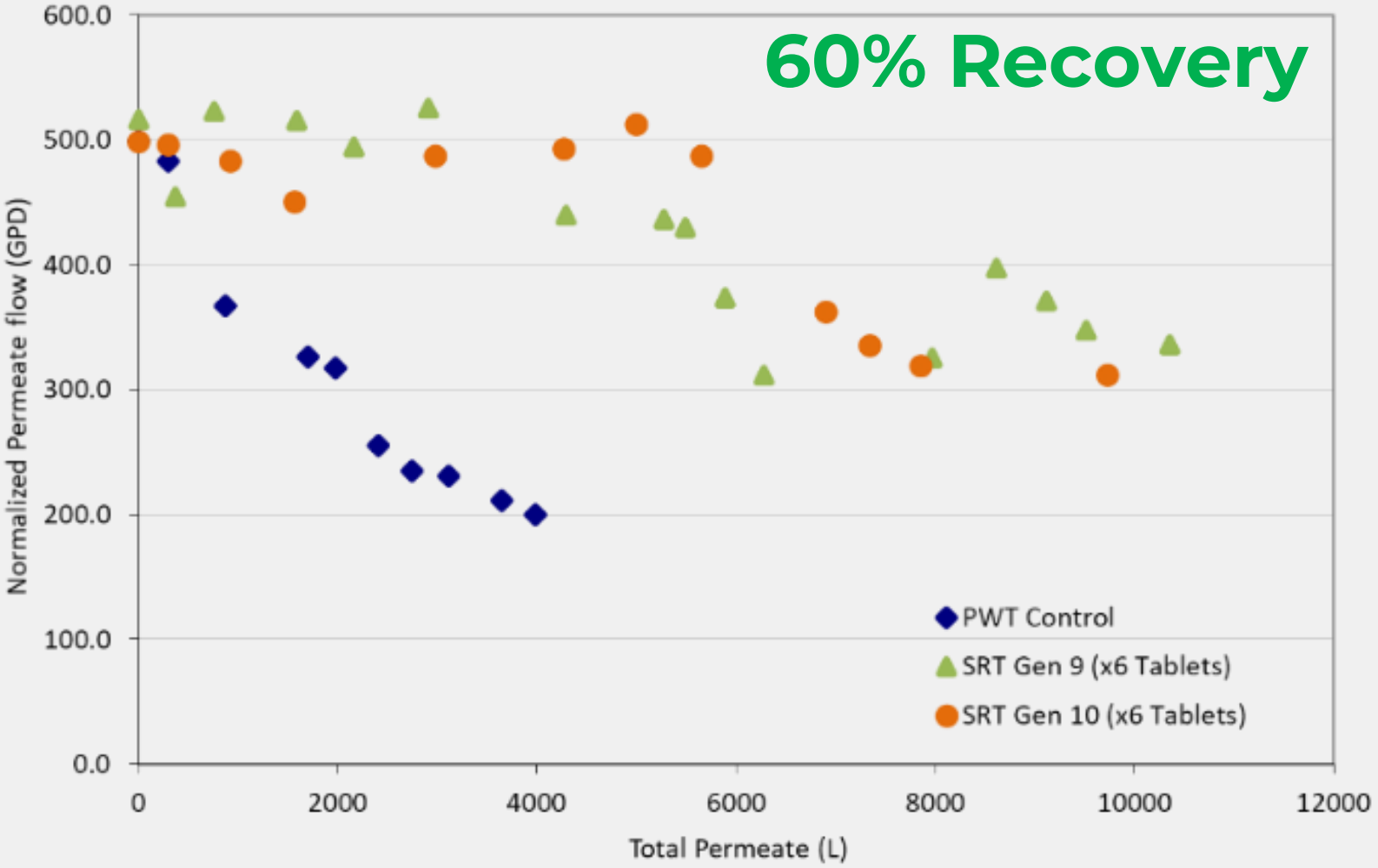
- Normal municipal tap water with hardness and Iron in feed water
- RO membrane showed sustained normalized flow as compared to one without SRT



New high flow and recovery POU RO

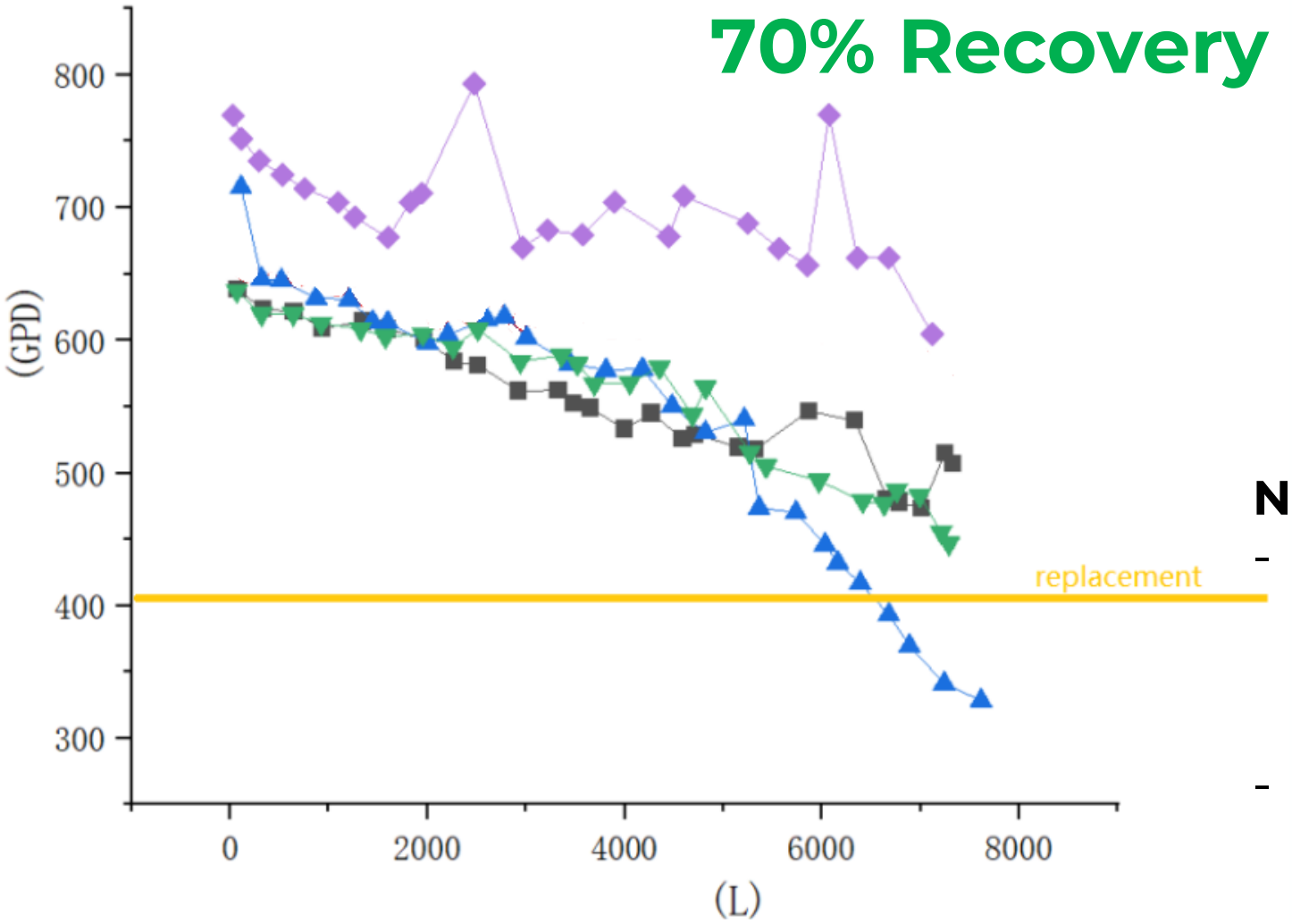
- A 600 GPD POU RO
- Units comes with a booster pump and pushes 60% and 70% recovery
- Set up was modified to control pressure drop across the RO while keeping recovery constant
- SRT’s were inserted in an independent filter housing

New high flow and recover POU RO



With the **6 SRT tablets** in place, a **5x extended** life and 10,000 L of permeate goal was achieved.

New high flow and recover POU RO



New regulation in China:

- Minimum recovery rate allowed for POU RO 45-50% and minimum lifetime 2.000-4.000L RO permeate

- Favors 65%~70% recovery and lifetime 4000~7000L RO permeate

Other possible applications

- SRT for small industrial 4” RO Systems (same concept as POU RO)
- SRT for scale controlling on small to medium size Cooling Towers and Evaporative Condensers

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- Would PWT Antiscalant SRT, be an interesting product for your company?
- Would your company be interested in joining the H_2O Innovation R&D and commercial teams to continue developing the new possible applications for SRT?


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PWT
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GLOBAL
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AWARDS