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Episode 51 Economies of Scale Show Notes

Michael Urbans and Allan Horner of Impact Water

- **What is an Antiscalant?** Antiscalant is commonly used in place of softening, it is a chemical typically comprised of polymeric inhibitor molecules in a phosphoric acid-based composition. As with most scaling applications, lowering pH and sequestering calcium carbonate and other scaling minerals can greatly decrease scaling.
- **When do we use antiscalants instead of water softeners?** Almost always. When I started in this industry in the 1980's, reverse osmosis membranes were new. It was innovative technology and extremely expensive. We would try to do anything to extend their life expectancy.
 - Scaling damage was the most frequent problem, especially when we tried to increase efficiency.
 - A common 4"x 40" membrane was over 10 times the cost of what they are today so the cost of protecting them was an issue.
 - At 20 grains hardness, we could spend \$1,000 a year in salt and the capital cost of a couple thousand dollars for a softener was not a problem. Now that superior quality membranes are a couple hundred dollars, **it is cheaper to simply replace them rather than protect them.** About 15 years ago I started working in the Pharma industry and in Southern California, we are under strict commercial wastewater restrictions. We live in a desert so all the water we use gets re-used by the next city closer to the Pacific Ocean.
 - Commercial softening has not been available in most of Southern California for several decades. Antiscalant has been our only option for protecting membranes and extending their life. **The cost of antiscalant injection used to be comparable to softening but this has also changed.**
 - **For smaller RO systems, the cost of antiscalant injection is about 1/3 of the softener capital cost and ¼ of the operating cost.** On larger systems the capital cost is far lower since the exact same injection system is used on a 2,000 GPD RO as is used on a 100,000 GPD RO.
 - The operating cost or the cost of chemical can also go down significantly since the use of concentrated antiscalant is significantly lower than what we consider "Raw" antiscalant. **Raw is 1,000,000 ppm, concentrated is typically 10X (10 times), or 10,000,000 ppm.** We currently offer antiscalant in UPS friendly 1-gallon jugs in 2X and 10X concentrates, as well as "raw" 5-gallon buckets, 10X 5-gallon buckets, and 55 Gallon drums. A 1-gallon jug of 10X concentrate can treat 2 million gallons of RO feedwater.
- **Are they approved for drinking water?** Yes, NSF 60 approvals are common for antiscalant manufacturers, even so, this is pre-RO so the vast majority of the antiscalant is rejected to waste.



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- **Are some formulations better than others?** Yes, but considering that the cost has become competitive between different formulations, **many companies simply offer a single formulation for most applications.** We used to review water reports and try to determine which antiscalant was most appropriate. Over the past 10 years, we have consolidated to a single formula that is slightly more expensive. The cost of having inventory of a single formula is well worth it. Unless you are doing municipal applications or extremely large RO systems, going for the “exact right formula” to save money does not make sense for smaller RO systems, (smaller being typically under ½ million gallon per day)
- **Are there simple rules of thumb for feeding Antiscalants?** In general, for most applications a 5-ppm feed for “raw” antiscalant is the most common setting. Many antiscalant injection manufacturers recommend 4-5 ppm, I have found that **overdosing can be worse than under dosing.** We recently had a system using a diaphragm pump that had low feed pressure, the RO booster pump was able to put a slight vacuum on the antiscalant pump and it started drawing high doses of antiscalant into a bank of twenty 8” membranes. In a week, they drew in over 50 gallons of antiscalant, and fouled the membranes with a glue-like substance. I have since started recommending peristaltic pumps since they are a double check valve design that can eliminate this problem from happening. With the newer ultra-low dosing peristaltic pumps, antiscalant injection has never been easier.
- **What do you look for in a water analysis? When it comes to membrane protection, I focus on organics and scaling minerals-pH, iron, manganese, alkalinity, hardness, TDS, and reduction of contaminants for specific applications.** For example, the reduction of boron in agricultural applications.
- **Benefits.** Any RO that is 1,000 GPD or more will benefit from antiscalant injection. The lowered cost of maintenance, even the lowered cost of potential liability from not hauling and lifting 50-pound bags of salt should be considered. When compared to softener maintenance, pouring a gallon of a mild chemical into a tank, and replacing a pump tube annually is minor. I am a huge proponent of softening, just not for commercial RO applications. The amount of salt released unnecessarily into the environment is eliminated with a low cost and simple antiscalant injection system. And unlike other technologies, **chemical antiscalant injection is quantifiable and well proven and accepted.**
- **How do we settle upon a feed rate?** Basically, take the permeate and concentrate rates, add them together and we do the math to get a 5 PPM injection rate. We sell 1-gallon jugs with all the math done for you since the math equation can be a little complex and having a cheat sheet is great!



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<https://www.wqrf.org/map.html>

USGS Water Data Map

<https://dashboard.waterdata.usgs.gov/app/nwd/?region=lower48&aoi=default>

WQA National Convention

<https://www.wqa.org/convention>

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Antiscalant with Silica Sequestrant

! WP Antiscalant is highly effective and is specially formulated for feed water with high levels of metal oxides, silica and scale forming minerals. It inhibits polymerization of reactive silica and disperses colloidal (non-reactive) silica. This product is effective in reducing the operating and capital costs of reverse osmosis, nanofiltration and ultrafiltration systems. The 2X concentrate is typically dosed at .1 ppm and the 10X concentrate is typically dosed at .5 PPM. See the chart below for the most common settings.

Use the math equation below to determine the correct dilution and injection rates for other pumps and flow rates.

Injection Pump GPD ÷ Reverse Osmosis Permeate & Concentrate flow in GPM x 1440 x Chemical Solution Strength in PPM

(18-AS102X Undiluted 2X concentrated antiscalant solution is 2,000,000 PPM)

(18-AS110X Undiluted 10X concentrated antiscalant solution is 10,000,000 PPM)

Common dilution and pump settings below.

It is highly recommended to use a low dosing pump.

The charts below are for use with our 1 GPD chemical injection pump.

1 Gallon=4 Quarts 1 Quart=4 Cups

18-AS102X (2x)

Feed Water GPM	2	3	4	5	7
Gal. of Clean Water	10	10	10	10	10
Anti-scalant	2 Qt	2 Qt	2 Qt	2 Qt	1 Qt
Set pump %	30	45	60	75	100

18-AS102X (2x)

Treats ≈400,000 gallons.
Common for ≤ 4000 GPD

18-AS110X (10x)

Treats ≈2,000,000 gallons.
Common for >4000 GPD

18-AS110X (10x)

Feed Water GPM	5	7	10	15	20	25	30	40	50	60	70
Gal. of Clean Water	10	10	10	10	10	10	10	10	10	10	10
Anti-scalant	1 Qt	1 Qt	1 Qt	1 Qt	2 Qt	2 Qt	2 Qt	1 Gal	1 Gal	2 Gal	2 Gal
Set pump %	35	50	70	100	70	85	100	70	90	60	70

1 Gallon, 4 Quarts, 128 Ounces

92G-ASG1

Revised 10-2022



IT'S YOUR WATER PODCAST SPECIAL

Stenner Low Dose Pump for Use with Anti-Scalant

PUMP ONLY – MODEL E10LHF	\$320.95
PUMP & TANK 7.5 GALLON	\$462.25
PUMP & TANK 15 GALLON	\$483.50
PUMP & TANK 30 GALLON	\$504.50

Special prices effective January 1st through March 31st2024.



ECON LD



Potentiometer



ECON Tank System

Quick Facts

- Up to 50.7 oz/hr @ 80 psi. max.
- Adjustable potentiometer
- 50:1 turndown
- Econ LD pump item number begin with E10H

Features

- Advantages of Stenner peristaltic pumps on page 1
- Patented quick release pump head
- Tube replacement without tools
- Brushless motor
- Enclosed housing
- Indoor/Outdoor
- Optional mounting accessories available
- Tank System ships with pump pre-mounted to tank

Accurate Low Volume Metering

The Econ LD is a precise, compact variable speed peristaltic pump designed for metering low volumes when reliability and accuracy are a must. Ideal for pumping flocculants, coagulants, sanitizers, and a variety of solutions. The quiet, long lasting brushless motor, in a totally enclosed housing, offers premium quality in a compact pump.

The design incorporates the latest microprocessor technology with a simple potentiometer control and on/off switch. The potentiometer has a 50:1 turndown offering a wide range of outputs. Adjusting the potentiometer clockwise gradually increases the pump speed to 100%. Turning the potentiometer fully counterclockwise turns the pump off.

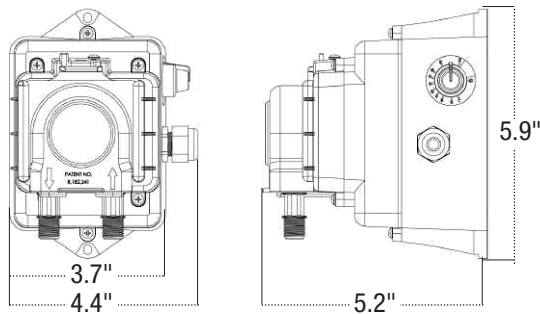
ECON LD SERIES

Weights and Dimensions

Shipping Weight 4 lbs (1.6 kg)

Box Dimensions 8 x 8 x 10 in. (21 x 21 x 25 cm)

Product Dimensions



Accessories Shipped with Each Pump

3 Connecting Nuts 1/4" & 3 Ferrules 1/4" or 6 mm *Europe*

1 Duckbill Check Valve

1 Weighted Suction Line Strainer 1/4" or 6 mm *Europe*

20' Suction/Discharge Tubing 1/4", white or UV black
or 20' Suction/Discharge, white, 6 mm *Europe*

1 Additional Pump Tube

1 Manual

Specifications

Flow Rate Output Control Potentiometer, 50:1 Turndown

Reproducibility $\pm 2\%$

Maximum Working Pressure 80 psi (5.5 bar)

Maximum Operating Temperature 104°F (40°C)

Maximum Suction Lift 25 ft (7.6 m) vertical lift, based on water

Motor Type 24VDC, brushless

Shaft rpm (average maximum) 17

Duty Cycle Continuous

Maximum Viscosity 50 Centipoise

Motor Voltage

120V 60Hz (0.25A), 230V 60Hz (0.17A),

230V 50Hz (10W), 24VDC (0.5A)

Power Cord Type

120V 60Hz, 230V 60Hz: SJTOW,

230V 50Hz: H05RN-F, 24VDC pigtail

Power Cord Plug End

120V 60Hz NEMA 5-15P, 230V 60Hz NEMA 6-15P,

230V 50Hz CEE7/7, 24VDC pigtail

Power Cord Length 6 ft (1.8 m) or 24VDC Pigtail 1 ft (30.5 cm)

Classification Indoor/Outdoor

Materials of Construction

All Housings Polycarbonate

Pump Tube & Check Valve Duckbill Santoprene® (FDA approved)

Pump Head Rollers Polyethylene

Suction/Discharge Tubing, Ferrules Polyethylene (FDA approved)

Tube and Injection Fittings PVC or Polypropylene (both NSF listed)

Connecting Nuts PVC or Polypropylene (both NSF listed)

Suction Line Strainer and Cap

PVC or Polypropylene (both NSF listed); ceramic weight

All Fasteners Stainless steel

NOTE: Refer to the chemical guide for material compatibility

Agency Listings



THIS PUMP IS TESTED AND CERTIFIED BY IAPMO ACCORDING TO ANS/NF 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.



IP44

Listings vary by model. 24VDC pumps do not carry any agency listings.

ECON LD SERIES

ECON LD 80 psi (5.5 bar) max. Flow Rate Outputs

Item Number Prefix	Pump Tube	Roller Assembly	Turndown Ratio	Ounces per Hour	Milliliters per Hour
E10LHM	M	White	50:1	0.04 to 2.4	1.3 to 70.0
E10LHF	F	White	50:1	0.11 to 8.1	3.2 to 240.0
E10LHG	G	Black	50:1	0.50 to 25.1	14.8 to 742.3
E10LHH	H	Black	50:1	1.01 to 50.7	29.7 to 1499.4

Approximate Max. Output @ 50/60Hz



To Order, Build Pump Item Number

Insert item number prefix and code for each specification.

code	Voltage & Hertz	code	Suction & Discharge Tubing
A	120V 60Hz	1	1/4" White
B	230V 60Hz	2	1/4" UV Black
5	24VDC	5	6 mm White <i>Europe</i>
C	230V 50Hz <i>International</i>	O.D does not affect output.	

Contact the factory for additional voltage and plug options.

OPTIONAL

To order **Tank System**, insert code before pump item number.

code	Tank System
S7G	7.5-Gallon UV Gray
S7N	7.5-Gallon White
S1G	15-Gallon UV Gray
S1N	15-Gallon White
S3G	30-Gallon UV Gray
S3N	30-Gallon White

NOTICE: The information within this chart is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs.