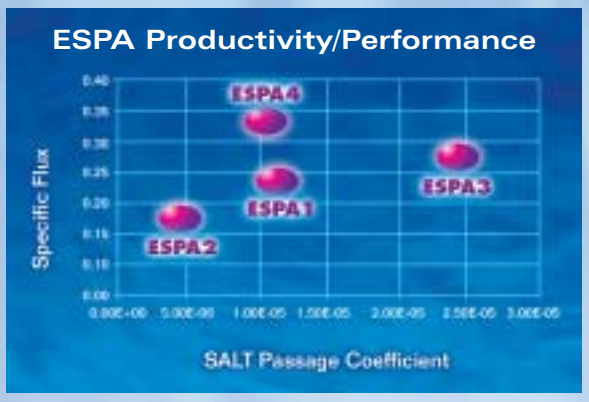
ESPA

High productivity membranes



A New Generation of ESPA Performance

The growing family of ESPA (Energy-Saving Polyamide) RO membranes continues to meet the ever-increasing demands of the water treatment industry. Users worldwide have made ESPA their first choice for high productivity and salt rejection.

ESPA1, ESPA2 and ESPA3 have long been the industry leaders, with the highest productivity and rejection available, producing up to 14,000 GPD.

Hydranautics' ESPA4 low energy membrane delivers even greater productivity and rejection, now at operating pressures of less than 100 psi. Enjoy up to 250% greater productivity per membrane area compared with conventional polyamide membranes, at the lowest cost per gallon produced.

There's an ESPA solution to fit even the most demanding water treatment needs - now with even greater performance, productivity and savings.

- **ESPA1 - The world's leading high productivity, energy-saving polyamide membrane**
- **ESPA2 - Combines high productivity, energy savings and lower salt passage**
- **ESPA3 - The industry's leading brackish water RO element**
- **ESPA4 - The highest productivity and rejection with next-generation performance**

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ESPA

Specifications

Test Conditions

The stated performance is initial (data taken after 30 minutes of operation), based on the following conditions:

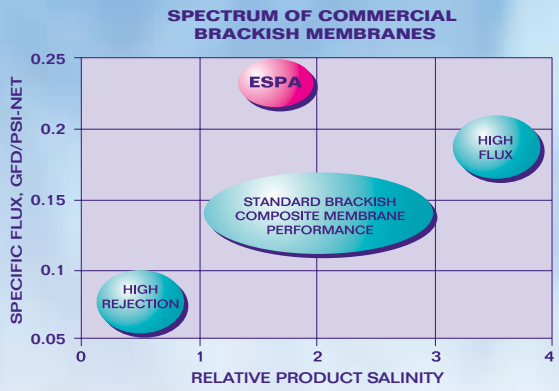
NaCl Solution*, PPM 1500
Applied Pressure**, psig (MPa) 150 (1.05)
Operating Temperature, ˚F (˚C) . . . . . .77˚ (25˚)
Permeate Recovery 15%
pH Range . . . . . .6.5 - 7.0

*ESPA4 NaCl Solution tested at 500 PPM
**ESPA4 tested at 100 psig

Application Data

Maximum Applied Pressure, psig (MPa) 600 (4.14)
Maximum Feed Flow, GPM (m^3/h) . . 4040-16(3.6), 8-inch -75(17.0)
Maximum Operating Temperature, °F (°C) . . . . . .113° (45°)
Feedwater pH Range[1] . . . . . .3.0 - 10.0
Maximum Feedwater Turbidity, NTU 1.0
Maximum Feedwater SDI (15 mins) 5.0
Maximum Chlorine Concentration, PPM . . . . . .<0.1
Maximum Ratio of Concentrate to Permeate Flow for Any Element . .5:1
Maximum Pressure Drop for Each Element, psig 10

[1]See technical literature for extended pH tolerance



Element Performance

Element Type	Min. Salt Rej., %	Nom. Salt Rej., %	Permeate Flow, GPD	(m^3/d)
ESPA1	99.0	99.3	12,000	(45.4)
ESPA1-4040	99.0	99.3	2,600	(9.8)
ESPA2	99.5	99.6	9,000	(34.1)
ESPA2-4040	99.4	99.6	1,900	(7.2)
ESPA3	98.0	98.5	14,000	(53.0)
ESPA3-4040	98.0	98.5	3,000	(11.4)
ESPA4*	99.0	99.2	12,000	(45.4)
ESPA4-4040*	99.0	99.2	2,500	(9.4)

*ESPA4 NaCl Solution tested at 500 PPM

ESPA installation, 5 MGD, in Carson, California

Selected Project References for Hydranautics' ESPA Membrane Elements

Town of Jupiter, Florida . . . .6 MGD (22,700 m^3/d) of potable water from a well water source

West Basin, California . . . . .5 MGD (19,000 m^3/d) of industrial water from a wastewater source

Vall Duxo, Valencia, Spain . . . . . .2 MGD (7500 m^3/d) of industrial water from a well water source

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