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Performance Evaluation of a Reverse Osmosis (RO) Filtration System for Water Purification

Testing Objective:

The "SmartRO 600" reverse osmosis system from SmarterWater was tested by ETR Laboratories to evaluate its ability to filter contaminants in municipal water, such as dissolved solids, heavy metals, and chemicals. The tests measured how well the system reduces these substances and assessed its performance, efficiency, and suitability for improving water quality.



Figure 1- "SmartRO 600" System and testing apparatus

Results:

A spiked water supply containing five contaminants—lead, total trihalomethanes (THMs), chlorine, sodium, and chloride—was processed through the "SmartRO 600" system. Test samples collected at 10 minute and 60 minute intervals confirmed the effective removal of all introduced contaminants. Additional testing for microplastics was also performed, with results indicating that none were present.

Testing/Conditions:

To dynamically test the "SmartRO 600" filtration system, contaminants were precisely added to 50 gallons of source water. THMs were spiked and confirmed

The integrity of the sample and results are dependent on the quality of the sampling. The results apply only to the actual sample tested. ETR Labs Inc. shall be held harmless from any liability arising out of the use of such results.

by the laboratory at 160 ppb, lead to 11 ppb, chlorine to 0.83 ppm, and sodium chloride to 22.87 ppm using standard solutions. The fortified source water was processed through the "SmartRO 600" at a flow rate of 0.5 gallons per minute continuously for 60 minutes. Samples were collected at different stages of filtration and compared to those before filtration.

Data/Discussion:

Results for all contaminants are shown below (Figure 2). Within 10 minutes of filtration, fortified source water contaminants were all reduced to non-detectable levels, apart from sodium which was reduced to below 1 ppm. After 60 minutes, these results were consistent.

Contaminants	Source Water	Results After Filter	Fortified Source Water	Results 10 Mins After Filter	Results 60 Mins After Filter
Lead (ppb)	Not Detected	Not Detected	11.00	Not Detected	Not Detected
Sodium (ppm)	16.15	1.90	22.87	0.44	0.73
Chloride (ppm)	20.37	3.71	36.19	Not Detected	Not Detected
Chlorine (ppm)	0.52	<0.10	0.83	<0.10	<0.10
Total THMs (ppb)	42.49	Not Detected	180.07	Not Detected	Not Detected

Figure 2- Performance results after filtering water fortified with different analytes.

Initially, TDS levels dropped from 48 ppm to 12 ppm (Figure 3). By the one-hour mark, after 32.5 gallons had passed through the filters, effluent TDS levels were reduced to 10 ppm, demonstrating the consistent filtration efficiency.

	Initial	10 Minutes	30 Minutes	45 Minutes	60 Minutes
TDS In (ppm)	48	48	47	46	47
TDS Out (ppm)	12	9	10	10	10

Figure 3- "SmartRO 600" TDS results.

An initial 500 mL of filtered source water was vacuum filtered and observed under the Scanning Electron Microscope. There were no observable microplastic particles. Visual inspection of the unfiltered water showed no evidence of floating or suspended particulate matter. A turbidity measurement was conducted and yielded a value of <0.20 NTU, indicating high levels of water clarity.

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