S1.6.2 A High Efficiency Household Reverse Osmosis Element

Jonathan Hou
AO Smith

Household Reverse Osmosis (RO) water purifiers are popular in many countries, which can remove almost all contaminates from feed water and provide safe drinking water to end users. However, water efficiency of traditional household RO purifiers is only 15~25%, which means more than 75% of feed water is discharged. In comparison, the industrial RO systems can achieve 75% efficiency by a serial connection of several RO elements together. This connection can build a long feed water channel and increase membrane surface flow velocity. The ratio of feed channel length to width is 4:1 to 8:1 and one reason household RO purifier efficiency is significantly low is because the ratio of the feed water channel length to width is 1:2. To overcome the shortages of a traditional household RO element, A.O. Smith developed a long feed water channel element. The new element has a modified water channel inside of the element and was built with a narrow and long water channel inside of the element. In this new element the ratio of the feed water channel length to width is 3:1, and the average membrane surface flow velocity of 75GPD element with the new design were 7.04cm/s and 3.02cm/s under 25% and 50% efficiency. Both were higher than the value of traditional element under 25% efficiency, which is 2.57cm/s; higher membrane surface flow velocity can reduce membrane fouling rate and extend membrane life. According to the benchmark testing result, the new element's fouling rate under 50% efficiency was 15% lower than traditional element under 25% efficiency. The volume of waste water discharge was 65% lower than traditional element and the field testing shows that the new element's service life is extended from two years of traditional element to three year under 50% efficiency.