



AAL and Fluoride

It is important to understand the limitations of Activated Alumina in reducing Fluoride from drinking water. Under ideal conditions, Activated Alumina (AAL) can do an effective job at reducing Fluoride in drinking water, but these ideal conditions are rare in residential applications. There are three independent factors that work together to determine whether AAL will work. These factors being flow **rate**, **pH** and **temperature**. Let's take a look at each of factors under familiar circumstances and conditions so that you can determine whether AAL is right for you.

The amount of contact time between the Fluoride and the AAL is the most important factor in determining whether or not it is a practical solution for residential drinking water systems. Contact time is determined by flow rate. To **remove** Fluoride, your flow rate cannot exceed 0.2gpm. That is less than one quart per minute – not a very convenient way to get drinking water! To **reduce** Fluoride with AAL, your flow rate affects the level of reduction achieved. The slower the flow the higher the removal percentage will be. There have been studies done showing that a flow rate of 0.5gpm, 2 quarts per minute, up to 75% reduction can be achieved under ideal conditions. An Athena has a flow rate 0.75gpm. Even if your flow rate is in this range, the other two factors also come into play.

pH values also have a big impact on how well the AAL can effectively treat Fluoride in water systems. The ideal pH for removing Fluoride with AAL is a low, acidic pH. AAL needs a pH5.5 - pH6.5 to be most effective in treating Fluoride. AAL does not perform well at neutral (pH7) or higher. Here's the rub: most water supplies are treated to be specifically above the neutral range and around a 7.6pH. This means that if pH drops below a pH7, the provider will commonly buffer the water supply to bring it back to neutral, or slightly higher. This is done because acidic water can cause corrosion in water systems. Some areas have a water supply that is naturally higher and in fact the national average in the US is a tap water pH of 8.1.

Temperature also has an effect on how well AAL can absorb Fluoride. AAL works best at a lower temperature and its effectiveness drops substantially with warmer water. The temperature of water coming into our homes varies greatly throughout the different seasons and times of the year. Almost all of our pipes and plumbing fixtures run underground, and as the ground around our homes bakes in the summer and freezes in the winter the, AAL can gain and lose its effectiveness.

So you can see that while it is clear that AAL can be effective for fluoride, it is highly unlikely that all three conditions will ever line up to be ideal. This is why virtually all water professionals will recommend purification as the preferred approach for fluoride reduction/removal.