The “Forever Chemical”

Feasibility of Thermal Evaporation Technology for

PFAS Chemical Removal from Water

Per- and Polyfluoroalkyl Substances (PFAS) or so called “Forever Chemicals” have been getting a lot of attention recently. The EPA recently unveiled a strategy to regulate these toxic forever chemicals to limit their contamination of public drinking water sources, groundwater, and even food. A federal drinking water standard for this newly designated hazardous chemical group is expected by 2023.

As such, there has been much interest in the effective methods to remove PFAS compounds from water. The EPA has been studying technologies to remove PFAS compounds from water, especially Perflourooctanesulfonic acid (PFOS) and Perflourooctanoic acid (PFOA), the two most studied PFAS species. EPA recommends three different technologies for the removal of PFAS in drinking water as a result of these studies. These are; Activated Carbon Filtration, Ion Exchange Treatment, and Membrane Separation also known a nanofiltration or reverse osmosis. EPA admits that the technologies studied were those that could be adapted to municipal water treatment facilities and other large scale water treatment systems.

Thermal evaporation, or distillation is also expected to be effective for the removal of PFAS compounds from water. This technology wasn’t included in EPA’s list of recommended technologies because it isn’t typically associated with large scale municipal water treatment facilities. Encore Green’s Mechanical Vapor recompression technology known as NOMAD Excel is expected to be effective at removing PFAS compounds from water given their low volatility. Laboratory testing would be needed to confirm the efficacy of NOMAD Excel at removing PFAS compounds but a company called Pure Water (mypurewater.com) markets a commercial distiller that has been laboratory verified to provide non-detectable levels of PFAS in the distillate fraction of treated water.

Additionally, Encore Green’s patent pending process known as Conservation by Design, because of its laboratory confirmation of water quality prior to land application, would confirm PFAS removal prior to any treated water being released to the environment.

One benefit of thermal technology vs filtration/ion exchange is that evaporation followed by distillation purification is not subject to end of service, integrity failure or breakthrough contamination. Evaporation/distillation can be considered an all or nothing technology meaning that as long as the feed water is heated sufficient for a phase change from water to gas (water vapor), the process is working 100%. There is no “partial” evaporation. The technology is either generating clean water or it is not.

NOMAD Excel is designed as a produced water desalination technology and Encore Green Environmental offers it to customers to treat oilfield wastewater to distilled quality so that it can be land applied for irrigation. Contaminants are concentrated in the waste brine where that can be managed with deep well disposal. It is expected that NOMAD Excel would function the same way with PFAS contaminated water. PFAS compounds would be concentrated in a small waste volume that can be disposed of in accordance with environmental regulations.