VSEP Vibes Newsletter

Welcome to the New Logic Research Newsletter.

New PFAS Drinking Water Rule Begins

Polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA, PFOS, and many other chemicals. PFAS have been manufactured and used in a variety of industries around the globe, including in the United States since the 1940s. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body – meaning they don't break down and they can accumulate over time. There is evidence that exposure to PFAS can lead to adverse human health effects. One common use is for fire-fighting foam. Teflon lined cooking pans used these materials as well.

The EPA is focusing on new rules for many industries to cover discharge of these materials. PFAS chemicals have been used for decades and are now found everywhere, even your local drinking water sources and well water. The EPA has known for a long time about the hazards of PFAS but has just recently accelerated rule making and focus on dealing with this problem. On April 10th, the EPA announced news rules for drinking water that would limit PFOA and PFOS to less than 4 parts per trillion. There will be a period of 3 years of measuring and a period 2 years for compliance. But in a few years, all municipal drinking water supplies are to meet this new rule. Similar to Arsenic, there is no safe level. The Arsenic rule used to be 50 ppb and was later lowered to 10 ppb. The risk is that even with 4 µg/L limits, these chemicals can accumulate and become dangerous. Previously, the EPA was floating a rule for drinking water with a 70 µg/L limit. But the rule just announced would be 4 µg/L.

The new rule will mean that about 16% of drinking water supplies will need to incorporate some form of treatment to remove or destroy these chemicals. The other option is to change the sources for drinking water to those with levels of PFAS that are low enough. Last June, a municipal utility discovered that it had 325 µg/L of PFOA in one of its wells. This was likely coming from some unknown industrial facility in the area. Fixing this problem will cost tens of billions of dollars. The EPA has announced there will be some federal money available to assist in remediation, but it is nowhere near enough to cover the cost of compliance nationwide. But I don't think the EPA has thought this through all the way. Now that the EPA has said anything more than 4 µg/L is unhealthy and can cause cancer, the lawsuits will begin. If you produce a beverage using unfiltered tap water and you had no idea the tap water is unsafe, you will be sued. These kind of lawsuits have already started to happen. Beverage companies will need to test their water source for these materials. If they are present in the feedwater, they will need to install a filtration system or get another source of water.

New Logic has experience with both PFOS and PFOA chemicals including two full-scale installations and several pilot tests. Spiral RO membranes can treat relatively clean water to remove PFAS.

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In 2004 New Logic installed a full-scale system to treat a waste stream containing non-ionic surfactant, PTFE solids, PFOA, and other unreacted fluorinated monomers. In 2013 New Logic installed a four module VSEP RO system for a company that manufactures fire extinguisher and fire suppression chemicals. Groundwater contamination occurred resulting in levels of PFOS, arsenic salts, and herbicide materials. A groundwater remediation plan was activated and groundwater was pumped out to be treated by the VSEP system. The four module VSEP RO system processes 156 gpm of the contaminated groundwater and produces 80% of that volume as RO permeate. The remaining concentrate is hauled and treated for zero discharge.

VSEP for Food and Beverage Applications

VSEP is often called on when nothing else works or for very difficult effluents like pig manure or landfill leachate. We have done projects where the main problem is that the piping in the effluent treatment plant plugs and scales, but the VSEP filter keeps working and does not scale. We have done some of these where the pipes to and from the VSEP completely block with scale such as Struvite, but the VSEP membrane is unscathed. In the early days of New Logic, we partnered with Pall Filtron and they licensed the VSEP technology for the food and beverage industry. This was an exclusive arrangement and New Logic was not allowed to do these applications under the license agreement. Eventually, the license agreement expired and New Logic was able to begin working on Food and Beverage projects. Since then, we have installed 13 projects in this market

Membranes are used extensively in this industry. Membranes can offer very precise separation characteristics and can be designed in a sanitary format. Unlike some other industries where it was previously inconceivable to use membranes because of fouling, the food industry has embraced membranes and they are widely used. Some of the food and beverage projects New Logic has installed recently include:

Whey Wastewater
Yeast Wastewater
Orange Juice Clarification
Beet Juice Clarification
Palm Oil Effluent
Winery Barrel Wash
Black Tea Extract Concentration
Coffee Extract Concentration

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VSEP at Spanish Research Center, AIDIMME

Inerco is a large solution provider engineering company with offices in 10 countries. The aim is to improve and offer a solution to meet real needs in each case is a guiding principles in its day-to-day operations. Putting themselves on the client's side has gives them a comprehensive vision of each problem to work on. There are several divisions that focus on industries that can benefit from sustainable solutions. One of these is the energy sector

To be at the forefront, it is fundamental to know at first hand the reality of industry on the ground and have proven experience. In this regard, INERCO's work is vouched for by over 100,000 testimonials of their work in a wide range of sectors during the last four decades. This has given them the ability to anticipate the needs of clients with regard to the regulations and standards that apply in each sector and market trends, which are to a large extent shaped by major industrial projects and large-scale infrastructures in the general interest.

Recently, New Logic was contacted by Jesus Manuel Tagua Gonzales, the director of the biogas division of Inerco. He was interested in the capabilities of VSEP to treat biogas effluent, metal bearing effluents, and other similar industrial effluents. After some discussions, they purchased a LP VSEP pilot machine which was then sent to Aidimme, an industry research organization that will study the use of VSEP for these application at their research center. The machine was shipped there and Landon Graham, New Logic's pilot test manager, went there to perform training for the Aidimme staff.

Aidimme receives half their revenue from government and half from industry. They will be testing three applications including concentration of Iron and Aluminum colloids, recovering precious metals from e-waste effluent, and Ammonium Nitrate concentration.

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Landon and the research staff ran a membrane selection on the aluminum – iron colloid sample. They tested RO, NF and UF to get a wide range of options. Samples were collected for them to analyze. Of course the VSEP had no issue with the suspended colloids. They then went through a full cleaning procedure using the Ultrasil products on site. The three technicians picked up operation quickly and seem very competent operating the equipment.

Inerco is very excited about using VSEP at AIDIMME for a variety of testing, including concentration of humic and fulvic acids from treated digestate. VSEP is very often an enabling technology that can allow for new treatment methods previously not possible. New Logic and Landon Graham will continue to work with them to help develop these new treatment methods.

For more information contact:

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Cleaning a VSEP Filter:

VSEP is designed differently than spiral RO membrane systems. Because they also have very tight spacing, they also do not clean very well since foulants that are removed from the membrane might lift off only to move a little further down and then get caught or refoul the membrane. Spiral membranes also act like sock filters when it comes to suspended solids. That's why there are limits on LSI or the amount of suspended solids that can enter the spiral. The thinking is that if these particles go in, they don't come out. That is also why precipitation of particles inside the module is problematic. Because cleaning is not very effective, spiral systems are designed so they don't rely on cleaning. They limit what can go in to prevent fouling and they assume an incredibly low flux rate and assume the membrane can foul for long periods of time before cleaning. When designing for low flux and not very often cleaning, they will need to use many more modules than they would if cleaning was effective or more often.

VSEP works in an opposite manner. VSEP has an open channel flow and has no limit on suspended

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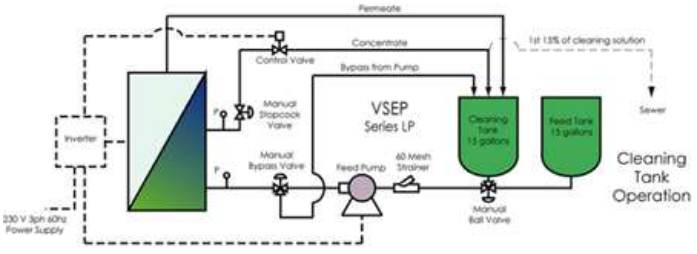
solids. In fact it can be used to concentrate Kaolin Clay up to the gel point, or the point at which the material will not flow anymore. The open channel allows particles that are lifted off during cleaning to easily be flushed out of the system. Cleaning is very effective in VSEP. Sometimes, just water flushing is all that is needed. The hold up volume of a VSEP module containing 1200 m2 of membrane is about 200 Liters. The cleaning solution can be re-circulated in the system and it is common to use 400-800 Liters of mixed cleaning solution to clean each filter pack.

VSEP modules are also much more expensive than spiral modules. When designing VSEP systems, we maximize the flux and the frequency of cleaning so the number of modules can be minimal. This results in the lowest capital and operating cost. People might think that cleaning once per day costs a lot and therefore VSEP is expensive if cleaning is done every day. VSEP could be operated with cleaning once per week or one per month or with no cleaning at all, but in these cases, more VSEP modules would be required like the spiral systems and instead of having 10 modules, you might need 20 modules. Now, you think you have saved money because you are cleaning less often, but now you are cleaning twice as many. Also you are replacing more membrane modules than before and you are consuming more energy. Your total operating costs are actually much more expensive when you clean less often. Cleaning as a cost per m3 is a small part of the total operating cost (maybe 15%).

Proper cleaning done frequently does not shorten life. In fact the opposite is true. Membrane life in the VSEP is usually determined by a loss of flux, not a loss of rejection. After two or three years, the membrane has lost 20-30% of its initial flux rate and cannot recover. So it is normally an economic decision to replace the module, not because of any damaged membrane. When you clean frequently, you can stay ahead of recalcitrant foulants. Cleaning will remove 99% of foulants. There are some bad actors that can accumulate. If you frequently chip away at these and don't let them set-up a resting place on the membrane, you can reduce the rate at which these materials will blind off the membrane.

New Logic has developed acidic and alkaline cleaners that are effective but don't damage the membrane. We have been building and shipping membrane systems for 35 years and have had no evidence that membrane cleaning damages the membrane. There are many other possible things that can damage membranes that one should worry about such as improper cleaning, excessive pH or temperature, exposure to chlorine or solvents, poor maintenance, and many other factors. All of these are far more problematic that cleaning chemicals. Often chemicals in the wastewater are far more dangerous to the membrane and membrane life that the cleaners that are used.



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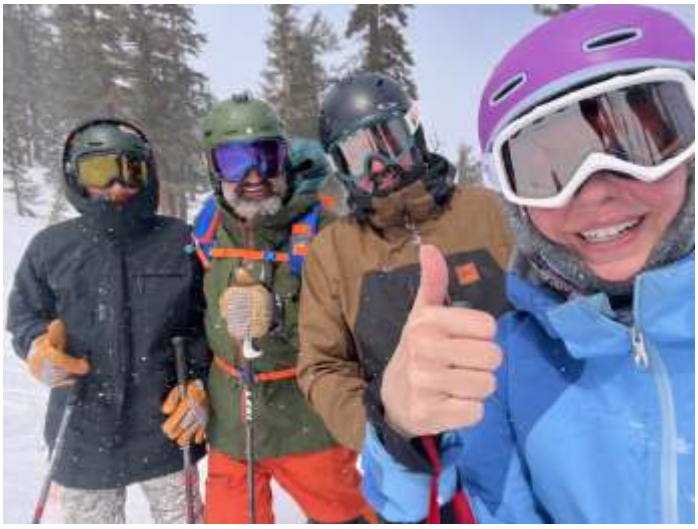
New Logic – More than just a Business

New Logic started 35 years ago. These were exciting times when we started a company and developed a new invention that has stood the test of time. We are still privately held and the founders of the company still run the business. Not many companies have done what we have. In most of business company acquisitions and mergers are common. Employee turnover is extensive and outsiders are hired to manage employees. New Logic still has many employees who were there on day one. We also have employees who's entire career since college has been with our company. This is not very common. We make a unique piece of equipment. While it is certainly helpful to have such a great machine, operating a successful company takes more than just having a great product. It is really the people behind the machine who work for the company that matter. Even if we do have enabling technology, unless you have the dedicated engineers who can incorporate this machine into complex processes, then the machine is useless.

Our company does not have a hierarchy and each employee is valued and in return they feel a great sense of satisfaction. So part of our success is the emphasis on the work-life balance. I believe that we need to make life count. Doing this now for 35 years, I know that you get one shot at life and at



making your mark. So your quality of life is just as important as your job.

Starting in the San Francisco Bay Area, the work-life balance became very difficult. The Bay Area presented many stressful challenges. Extremely high taxes, nightmare traffic, homeless encampments on the roof of our building, rampant crime where people would just walk in our doors and steal laptops, all led to a very undesirable environment. It is not an easy thing to just pick up a manufacturing business and move it, but that is what we did. Nevada welcomed us with open arms and we even met with the Governor who was concerned about our well-being and offered assistance for us to relocate.

Now people have commutes that are less than 5 minutes and a quality of life that is incredible. There are no income taxes in Nevada and outdoor recreation like fishing, off-roading, and world class skiing are just 20 minutes away. The schools are clean, safe, and well run. So because the owners of the company believe so strongly in employee well-being and a great work-life balance, we risked a lot to move the company 6 years ago.

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Minnesota Landfill to Install VSEP

Recently the federal government enacted the American Rescue Plan Act (ARPA) that delivered $250 Billion for many local governments to help them recover from the economic impact of the Covid 19 shut-downs. The added cost of the response to the virus and the loss of tax revenue from businesses shutting down put a heavy load on state and local governments who cannot run a deficit. Among the allowable uses for the grant funds are to invest in water and sewer projects.

St Louis County in Northeastern Minnesota is the largest county east of the Mississippi. It is known for its spectacular natural beauty, lakes, and trout streams. Much of the area has been built on the history of logging and the abundance of iron ore. The County applied for ARPA funds and has received the grant. On June 4th of 2024, the St Louis County Board of Commissioners voted to approve the purchase of a VSEP RO system to be used at a landfill near Virginia Minnesota. Prior to this, extensive onsite pilot testing was conducted using a VSEP LP pilot system. Once the results were obtained, several months of engineering design and review were conducted to finalize a leachate treatment process that incorporates a 3 module VSEP system. The landfill had an existing treatment process, but an upgrade was needed due to the coming regulations for PFAS discharge. The EPA is currently working on new limits of these fluorinated polymers for landfills specifically.

Most landfills in the United States are able to take leachate to a local sewage treatment plant and that is how they generally deal with the leachate volume. However, this will be changing since discharge of the leachate to the POTW would mean that the local sewer discharge would then not be in compliance with PFAS limits. As a results many landfills will need to install their own effluent treatment process. Since there are many thousands of landfills, this will be an enormous task.

VSEP System installed in 2004 for PFOA removal

New Logic has good experience with PFAS removal and even installed a full-scale system 12 years ago in Marinette Wisconsin. A firefighting foam manufacturing company there had discovered contamination in the local Menominee River sediment and was required to clean this up. Dredging activities generated water after settling that required treatment before this water could be returned to the river. A four module VSEP system

was installed and run for several years to remove and concentrate PFAS materials as well as Arsenic and other contaminants. Once the remediation was complete, the VSEP system was converted to other uses at the plant to treat various effluents. Minnesota Mining and Manufacturing company (3M) is headquartered in Maplewood Minnesota. The company has manufactured a wide range of products. In 1947, 3M began producing Perfluorooctanoic Acid (PFOA) by electrochemical fluorination. In 1951, Dupont purchased PFOA from 3M for use in the manufacturing of Teflon. So, there is a long history of PFAS materials being manufactured in Minnesota. These forever chemicals are found everywhere now, but there is more focus near the manufacturing facilities that have handled these in the past. Of course local landfills would often be the recipient for many of the waste products and so this is a particular concern.

Rep Spotlight – Soliqtec

This year, New Logic has signed a representative agreement with Soliqtec, a 40 year+ engineering company in Mexico. Soliqtec is a well-disciplined company with vast experience in many industries. They offer a wide selection of technologies to help their customers with a complete solution. After learning about VSEP and how that can be an integral part of a solution design, they contacted us to begin our cooperation.

New Logic has already reviewed and quoted several projects primarily in the food industry to treat plant effluents for compliance with discharge regulations. Because of their extensive history and experience, Soliqtec also has reach beyond Mexico including many places in Latin America.

From their website: "In SOLIQTEC, we stand out in offering comprehensive engineering solutions backed by cutting-edge specialized programs. Our focus is on the application of advanced methodologies and specialized design tools to create innovative and efficient systems. Our team of highly skilled engineers utilizes specialized software for modeling, simulation, and analysis, ensuring precision and optimization at every stage of the design process. From conceptualization to implementation, we employ advanced technologies to develop systems that meet the most demanding technical specifications."

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