VSEP Vibes Newsletter

VSEP Application – Plastic Recycling Wastewater

Polyethylene Terephthalate, or PET, is one of the most common plastics used for beverage containers. These plastic bottles are recycled all over the world and there are thousands of small recycling companies that process the used bottles to recycle them into polyester materials that can be used to make carpet, clothing, sheets, or other materials.

In plastic recycling, first the plastic is sorted by the type of resin or plastic material. Then in the case of PET bottles, they are sorted in terms of color. These are then baled and transported to the recycling company. The material is then shredded producing fragments called PET Flakes. These are then washed in a high pH caustic wash solution that may also include surfactants. This washing removes the residual contents that were in the bottle as well and the labels and glue. After the caustic wash, the flake is rinsed. The cleanliness of the flake is an important factor when determining the value of the PET material. Bake tests and other color measurements are used to determine the PET purity and value after processing. So effective cleaning is essential to profitability. After the rinsing, the flake is dried to remove as much humidity as possible. The moisture content must be less than 100 ppm or hydrolysis can occur during the melt process.

Transportation costs are critical when it comes to plastic recycling and so recycling facilities tend to be regional and there are thousands of these facilities. A typical recycling facility will consume about 200 gpm (45 m3/hr) of clean water for its operations. With no recycling of water, the plant would also discharge 200 gpm of spent wash solutions.

After all, since these are recycling facilities, it makes sense to recycle the water too.

With no recycling, the company is buying town water or paying to have well water pumped. Then the water is heated to 70-90º C. The caustic is purchased and added to the clean hot water. After use, acid is purchased and added to the effluent prior to discharge. There may also be suspended solids, BOD, and volume surcharges from the local municipality. If you add all these up it is a significant cost and burden to the company.

New Logic has developed a process where 90% of the caustic wash water can be reused by filtration with Nanofiltration. In addition, VSEP can filter the rinse water using RO and can recycle 90% of the rinse water. Other companies offer an effluent recycling option for this effluent, but these tend to be large multi-step processes involving dissimilar technologies resulting in a much lower water recovery rate and higher operating costs.

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During a recent pilot trial, a VSEP using a 500 Dalton NF membrane filtered the spent caustic wash water after 100 mesh prescreening. The NF membrane had an average flux of 16 gfd (27 LMH) at 500 psi (35 Bar) and recovered 91% of the volume as clean filtrate. The effluent fed to the VSEP had COD of 34,500 mg/L and the NF permeate had COD of 1,000 mg/L and was clear with no color or turbidity. The pH of the filtrate was unchanged and 100% of the caustic and detergent was able to pass through the membrane.

Another test was done using RO on the rinse water producing clean water with 394µS conductivity and 470 mg/L COD.

The benefits of this kind of system are that the recycling facility can reduce its incoming water consumption and its effluent discharge by 90%. 10% make up volume is needed and so the purchase or caustic and acid can also be reduced by 90%. Most importantly, the heat is recovered as well, so the energy savings from reusing hot water can also be realized.

Get to Know New Logic – Matt O'Brien

Each month we will feature one of our excellent VSEP engineers. The quality of our people is really the reason for our durability and success for now 32 years. Our engineer of the month this time is Matt O'Brien. Matt has been with New Logic for 13 years. Matt has a beautiful wife and two fine young boys that will benefit from having a great role-model. Matt is one of the hardest working engineers and is relentless when it comes to completing a project with good results.

Matt has a strong mechanical background and can fix almost anything. He started at New Logic assembling VSEP machines and systems. He quickly progressed through the company ranks and was soon running VSEP bench tests where he got to learn about the amazing ability of membranes to perform precise separations. After mastering the VSEP LP pilot machines in the lab, Matt went on field pilot assignments all over the world. Mat has completed dozens of field pilots for many different applications including Leachate, Phosphate Pond Water, Manure,

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Copper Wastewater, Soy Wastewater, and more.

Completing the VSEP progression, Matt is now project manager for many full-scale VSEP projects. After the sale and installation of each system, our engineers are assigned to watch over installed projects and lend support as needed. Matt is looking after many full-scale systems including a Truck Wash for Blue Beacon, cooling Tower Blowdown for Burney Power, PTFE Wastewater for Daikin, Winery Effluent for Jackson Family Wines, Catalytic Converter Coating for Umicore, and many others. Matt has been successful in keeping these systems running like a top. If Matt is assigned to your project, you will benefit from his years of experience and skill.

VSEP at IFAT Africa

TALBOT The Art of Water

IFAT Africa is a forum and an exhibition on environmental technologies, which takes place once a year in Johannesburg. As an offshoot of the IFAT in Munich, it offers the full range of environmental technologies and services with a comprehensive product portfolio ranging from simple to technologically advanced machines and solutions in the areas of water, sewage, refuse, recycling and energy conservation. Especially in Africa, investment in infrastructure and water supply are urgently needed. Growing populations, economic expansion, scarce water resources and extensive agriculture confront the government with major challenges. IFAT Africa presents innovative technologies and solutions and ensures a high-quality knowledge and information exchange.

General Manager, Claire Lipsett

This year, New Logic's new representative Talbot displayed a VSEP Series B demonstration machine in their booth. Inclusion of the VSEP into the product offerings of Talbot has been organized by the General Manager of Consulting Services, Claire Lipsett.

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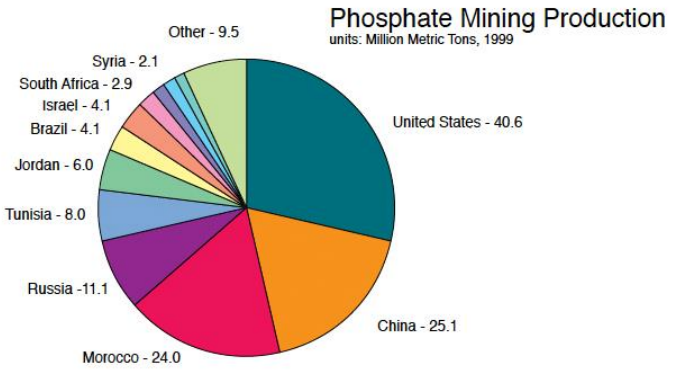
Application Note: Phosphate Mine Wastewater

Phosphoric Acid is used primarily in the manufacture of fertilizers, detergents, and pharmaceuticals. Phosphorous is one of the elements essential for plant growth. Organic Phosphates are the compounds that provide energy for most of the chemical reactions that occur in living cells. Therefore, enriching soils with Phosphate Fertilizers enhances plant growth.



Phosphate mining is concentrated in areas where deposits of phosphorous exist. These places include Florida, North Carolina, Wyoming, Idaho, Ontario, Saskatchewan, Queensland Australia, Morocco, and Jordan. Interestingly, phosphate harvesting is a big industry on the Christmas Islands where bird droppings accumulate in great quantities. Mining in the early part of this century was done by hand using a pick and shovel. Then in 1920, Bill Carey developed the dragline, a mechanized shovel capable of 600 cubic yards per hour. Today's draglines can weigh up to 3650 tons with a reach of 325 feet. The process of mining Phosphorous ore involves first removing about 25' of overburden.

The phosphate rock is removed using the dragline and sent to a washer where large clay balls are pulverized and removed. The remainder passes through a shaker screen where sand and phosphate pebbles are recovered. This slurry is sent to a floatation basin where the sand and phosphate are separated. The sand is saved for reclamation and the phosphate is dewatered and stored in stockpiles. The stored phosphate rock is shipped by rail to the processing plant where it is finely ground to a uniform size and mixed with Sulfuric Acid. The result is Calcium Sulfate and Phosphoric Acid. The Calcium Sulfate (gypsum) is removed by clarification from the Phosphoric Acid.

From here, the Phosphoric Acid can be processed into many things including various grades of commercial Phosphoric Acid. The largest use is for fertilizer. In this case the Phosphoric Acid is reacted with Ammonia (a nitrogen source) to for Monoammonium Phosphate (MAP), Diammonium Phosphate (DAP), or Triammonium Phosphate (Liquid Poly-Ammonium Phosphate 10-34-0)

The wet process manufacture of phosphoric acid as practiced produces a large volume of process water containing gypsum and other materials. The water is stored in vary large ponds known as phosphogypsum stacks. These ponds can be used as storage areas and also as a heat transfer mechanism for cooling. Careful water management must be used to operate the system at par or with a negative water balance. However, it may become necessary to treat the surplus water and discharge it to the surface waters or use it for other clean water needs of the plant in order to manage pond levels.

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Wastewater Storage Ponds in Florida

Mines also have a limited life and the time will come when all of the ore has been extracted. During mine closure and remediation, the pond water must be dealt with. Before it can be discharged, the water in these ponds must be treated. The volume of water that needs treatment is in the billions of gallons for a typical mine. A storage pond can cover an area of 600 acres. The cooling pond water also has a very low pH and contains a mixture of regulated inorganic chemicals including radioactive Radium that cannot be discharged without treatment.

The pond water will typically have total solids of between 2% and 4%. Using the standard VSEP system with 30 Bar pressure, VSEP can recover 50% of the volume which is then treated by spiral RO systems to polish to meet limits for the treated water. With high pressure, VSEP can achieve 75% recovery. The concentration of the effluent can also make recovery of some products more economical. Uranium can be extracted from the VSEP concentrate for recovery. In addition, high levels of Phosphorous are present and this can be recovered as well.

New Logic has pilot tested several phosphate mines for this application. One of these mines has installed a 6 module VSEP system and is using that as a full-scale pilot for treatment of this gypsum pond water. Almost all mines have tailings ponds where large volumes of acidic wastewater is stored. Storing can last for decades, but management of the pond levels can be problematic and at mine closure time, remediation of this water must be accomplished.

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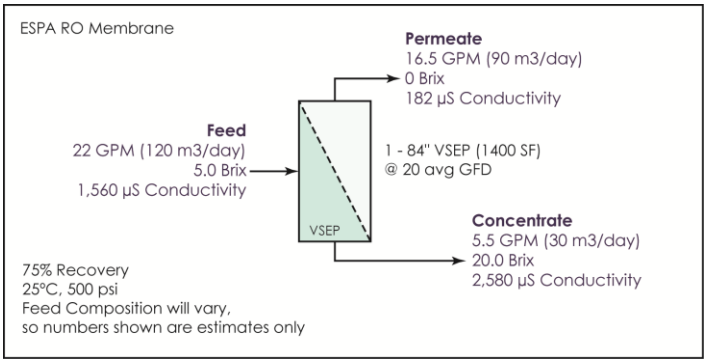
New VSEP Application – Sugar Concentration

New Logic has been conducting extensive pilot testing for Pepsi to filter expired and off-spec beverage products to remove water and concentrate sugars. All companies that manufacture soda drinks and other sugary beverages have to deal with bad product. Beverage deliveries are made to supermarkets and stores that stock these products. Many of them will have a limited shelf life. The expired products are picked up by the beverage manufacturer and returned to the factory. This product is then sent to a crusher where the glass bottles, cans, and plastic containers are crushed for recycling. The drink product is then sent to the sanitary sewer for discharge.

While this represents a huge waste of product, it can also result in high surcharges paid to the sewer district for BOD. New Logic has been testing this application to see if there can be a win/win solution. The sugar and other nutrients could be a valuable product that could be sold as an animal feed supplements, but because they tend to be 95% water, the shipping costs alone make this unviable. However, if the sugar can be concentrated to high enough levels, then this waste stream can be turned into a revenue stream.

The threshold for economic viability is about 20% sugar or 20 Brix as it is measured. New Logic has tested several Pepsi products including its Cola, Gatorade, juice, and dairy beverages and has concentrated these to between 20 and 28% sugar. In addition to recovering the sugar as a value added product, the clean water can be reused and the sewer discharge is eliminated altogether.

This can be a great improvement to company sustainability programs. It would reduce the amount of water consumed and eliminate the sewer discharge of the waste.



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