VSEP Membrane Filtration of Table Olive Wastewater

New Logic Research manufactures a proprietary vibrating membrane filtration system that is uniquely suited for treatment of all kinds of wastewater generated during the processing of table olives and the production of olive oil. The use of a vibrating membrane mechanism to avoid membrane fouling is new and is just the kind of improvement needed to make the use of membrane filtration an effective and economical treatment solution. New Logic has completed studies using this vibrating membrane system for treatment of this wastewater. The results have demonstrated many advantages of this new membrane technology when compared to the conventional treatment methods. This new membrane system is know as VSEP, which is an acronym for Vibratory Shear Enhanced Process and is manufactured by New Logic Research at its factory in Emeryville California near San Francisco.

Olive growing is typically done in very historic regions and the planting operations are often in place for many decades. Often civilization can creep in towards these operations putting pressure on land values, environmental concerns, and good neighbor issues. Since the typical method of treatment is by using double lined evaporation ponds to eliminate the waste, the process can often be smelly and the risk of leakage can present a potential liability to the operation. These storage ponds can take up a lot of space and if more capacity is needed, more storage ponds are built on land that could be used for other more productive purposes.

Agricultural operations are becoming increasingly regulated and also pressure from the public for more sustainable operations is changing the industry. These changes can be difficult as processing methods that have worked for centuries must be modified and new method must be implemented to stay ahead of regulation and compliance. Sustainable farming can be more than just a marketing tool. It also can be economically favorable for the farmer. It is possible to meet ever-increasing discharge and air emission regulations while saving money at the same time. New Logic's treatment process allows for this opportunity.

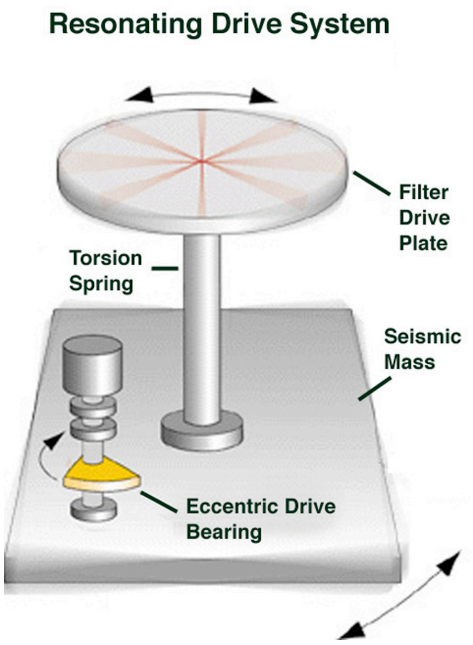
The VSEP process can treat the olive processing wastewater so that any oils lost in processing can be recovered. In addition, clean drinkable water can be recycled in the process. Finally, the dissolved and suspended solids found in the wastewater can be concentrated and recovered as a value added byproduct that can be sold. The VSEP process allows recovery of three valuable materials and turns the wastewater from a liability to a revenue stream.

The first step involves the use of Ultrafiltration (UF) membranes in a primary treatment stage. This membrane allows soluble materials and water to pass, but will hold back the oil and suspended solids that can be segregated so that the oil can be recovered. Then in a second stage, the VSEP Reverse Osmosis (RO) system filters the UF permeate to allow clean water to pass and concentrate the soluble organic material and minerals.

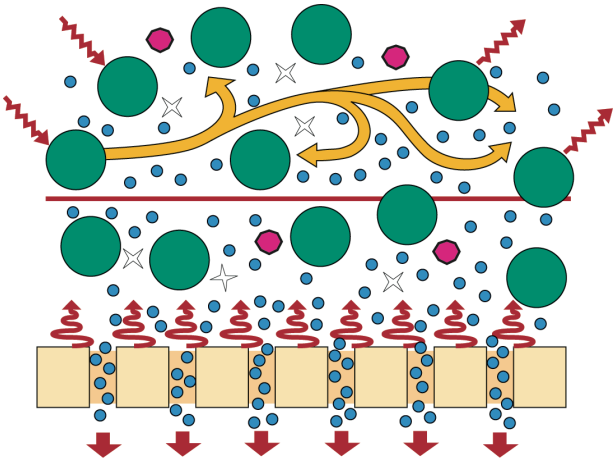
VSEP Advantages

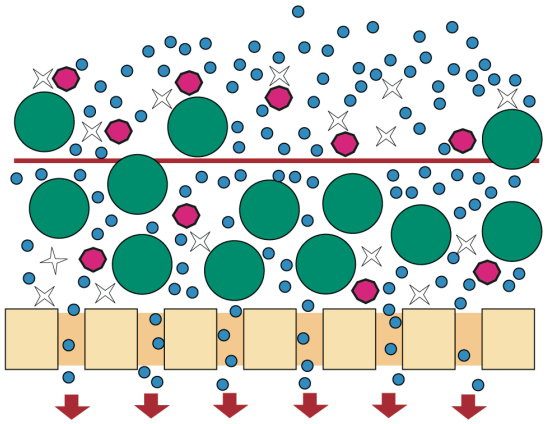
VSEP employs torsional vibration of the membrane surface, which creates high shear energy at the surface of the membrane. The result is that colloidal fouling and polarization of the membrane due to concentration of rejected materials are greatly reduced. Since colloidal fouling is avoided due to the vibration, the use of pretreatment to prevent membrane blinding is not required. In addition, the throughput rates of VSEP are 5-15 times higher in terms of GFD (gallons per square foot per day) throughput when compared to other types of membrane systems. The sinusoidal shear waves propagating from the membrane surface act to hold suspended particles above the membrane surface allowing free transport of the liquid media through the membrane.

The VSEP membrane system is a vertical plate and frame type of construction where membrane leafs are stacked by the hundreds on top of each other. The result of this is that the horizontal footprint of the unit is very small. As much as 1,400 square feet (120 m2) of membrane is contained in one VSEP module with a footprint of only 4' x 4'. A VSEP system can be contained in a very small metal building and takes up a fraction of the space required by evaporation ponds.



Conventional membranes are subject to colloidal fouling as suspended matter can become attached to the membrane surface and obstruct filtration. Crossflow is used to reduce the effects of this accumulation. Just as conventional membranes have limits on TDS due to the solubility limits of the various constituents, they also have limits on TSS, as colloidal fouling will occur if these levels are too high. VSEP employs torsional oscillation at a rate of 50 Hz at the membrane surface to inhibit diffusion polarization of suspended colloids. This is a very effective method of colloid repulsion as sinusoidal shear waves from the membrane surface help to repel oncoming particles. The result is that suspended solids are held in suspension hovering above the membrane as a parallel layer where they can be washed away by tangential crossflow. This washing away process occurs at equilibrium. Pressure and filtration rate will determine the thickness and mass of the suspended layer. Particles of suspended colloids will be washed away by crossflow and at the same time new particles will arrive. The removal and arrival rate will be different at first until parody is reached and a state of equilibrium is reached with respect to the diffusion layer. (Also known as a boundary layer)





This layer is permeable and is not attached to the membrane and is actually suspended above it. If too many of the scale colloids are formed, more will be removed to maintain the equilibrium of the diffusion layer. As documented by other studies, VSEP is not limited when it comes to TSS concentrations as conventional membrane systems are. Conventional membrane systems could develop cakes of colloids that would grow large enough to completely blind the conventional membrane. In VSEP, no matter how many arriving colloids there are, an equal number are removed as the diffusion layer is limited in size and cannot grow large enough to blind the system. In fact VSEP is capable of filtration of any liquid solution as long as it remains a liquid.

VSEP Olive Wastewater Treatment

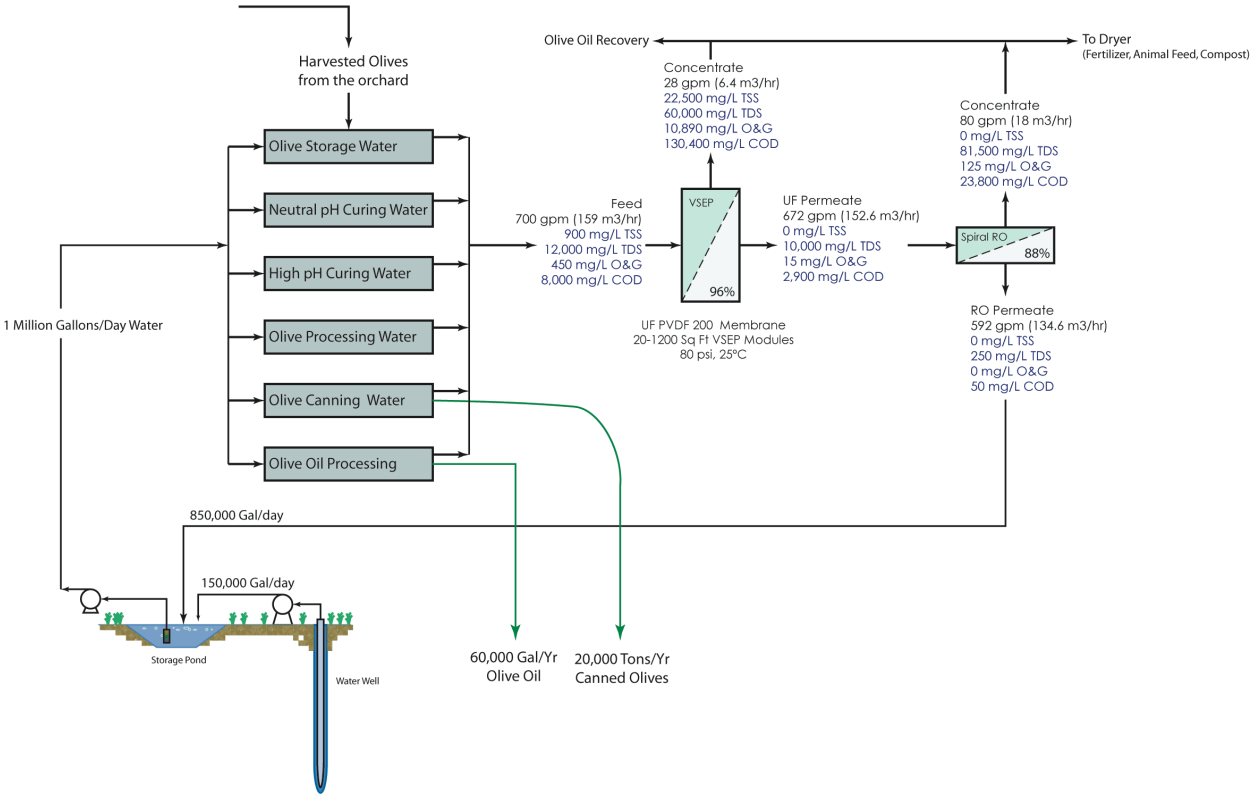
VSEP has been studied by several olive processing facilities who are facing new challenges as the industry changes. These operations have many concerns. They would like to recover the oil that is lost and has a high value. They are also dealing with pressure from regulators when it comes to environmental compliance and complaints about smells. They also need an economical solution that won't disrupt the operating costs of their operation.

Some of these facilities, especially small operations may be hauling the wastewater. VSEP can be used as an alternative to hauling and would yield immediate operating costs savings as the operating costs of VSEP can be 25-50% of hauling. Others who are at capacity due to the storage space of evaporation ponds can expand operations and process more material if the small footprint VSEP system is installed so that more storage ponds don't need to be constructed. The cost of a VSEP system is competitive with the cost of constructing a new evaporation pond. Also, for those operations that have problems with existing evaporation ponds such as smell or leakage can install a VSEP system and abandon the storage ponds altogether.

Summary

New Logic's VSEP system provides an alternative approach for olive processing and value added product recovery. With just a single unit operation step, VSEP will separate oil, suspended solids, organics, minerals, and leave clean drinkable water that can be reused. In addition, VSEP will eliminate the need for complicated multi-step conventional treatment processes and technologies without chemical treatment. The value added materials recovered from VSEP can be "Organic" compliant.

Zero-Liquid Discharge Olive Wastewater



The justification for the use of VSEP treatment system in your process is determined through analysis of the system cost and benefits including:

- Recovery of solids products from the effluent streams.
- Efficient dewatering of the solids prior to drying or final shipment.
- Elimination of effluent discharge, hauling, or evaporation ponds.
- Provision of high quality water for reintroduction into the process.
- Offset fresh water demands and pretreatment cost.
- Retain heat in recycled process water, thus reduce energy requirements.
- Simplify effluent treatment with a compact, low energy system.

New Logic Research has supplied VSEP separation technology successfully into many industrial processes. The olive processing industry effort to recover products from effluent streams will be enhanced with the utilization of membrane filtration techniques combined with "Vibratory Shear Enhanced Processing". The availability of new membrane materials and VSEP technology make it possible to treat the more difficult streams such as olive wastewater with very successful economic results.

Contact a New Logic representative to develop an economic analysis and justification for the VSEP in your system. For additional information and potential application of this technology to your process, visit New Logic's Website @ http:/www.vsep.com or contact New Logic, 1295 Sixty Seventh Street, Emeryville, CA 94608, Phone: 510-655-7305, Fax: 510-655-7307, E-mail: info@vsep.com.