NEW LOGIC INTERNATIONAL, INC.

Case Study

Industrial Laundry Wastewater Treatment

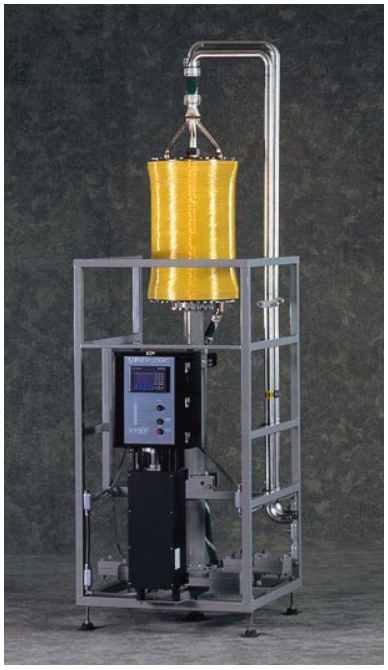
A cost-effective and environmentally-sound solution

Overview

A wastewater treatment system was installed in July of 1998 at Hospital Central Services, a major laundry facility in Seattle, Washington. The system, manufactured by New Logic International of Emeryville, CA, will be used for wastewater treatment and water recycling at this facility. The VSEP (Vibratory Shear Enhanced Processing) system uses an ultrafiltration membrane module and is able to recycle up to 80 percent of the water used at this facility. Economics of installing the VSEP system are extremely attractive and point to a price recovery of 11 months. The City of Seattle contributed funding via their "Water Smart Tech. Program" to encourage water reclamation. Application of the VSEP membrane technology for treatment and recycling of wastewater from large industrial laundry facilities is found to be an attractive economic reality.

Background

Hospital Central Services Association (HCSA) operates a large institutional laundry that provides service to eleven hospitals in Seattle, Washington. The laundry processes twenty million pounds of laundry per year and operates 14 hours per day, 364 days per year. Linens such as sheets, towels, and surgical scrubs are cleaned at the laundry. Water used in the laundry is provided by the City of Seattle. The maximum water usage rate in the laundry is approximately 100 gallons per minute with 38 million gallons of fresh water used annually. Wastewater from the laundry process is discharged to the Metro/King sewer. Wastewater from the laundry washing and rinsing cycles are collected in a pit and then pumped to the sewer. HCSA installed the VSEP system to allow the recycling of wastewater back to the laundry process. VSEP is a proprietrary, non-fouling membrane filtration system.



The VSEP system takes up just 20 square feet of floor space and requires enough power to drive a 20 hp electric motor.

The main purpose of the VSEP system is to reduce suspended solids (TSS), oil and grease from the effluent water for reuse in the laundry process. This project summary report describes this application of the VSEP system, discusses the expected process performance, and presents the economic advantages of the process for this application.

System Description

A block flow diagram for this application of VSEP is shown in figure 1. This diagram presents the overall material balance for the laundry facility and illustrates the performance of the VSEP unit as well. The laundry facility generally requires a water usage rate of up to 100 gpm. Upon installation of VSEP, with its ability to recycle clean water to the laundry machines, fresh water usage is reduced from 100 gpm to a rate of 30 gpm.

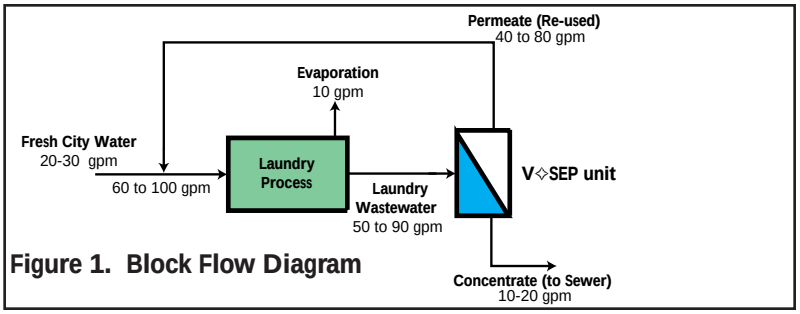


Figure 1. Block Flow Diagram

The introduction of VSEP for effluent treatment makes it possible to recycle up to 80 gpm for reuse in the laundry machines. Oil and grease and total suspended solids (TSS) are reduced from 33 ppm and 110 ppm to non-detectable levels.

The total BOD measured in the wastewater is made up of two different constituents: soluble BOD and insoluble BOD. Insoluble BOD is associated with the suspended solids in the wastewater and would be expected to be completely removed. Soluble BOD, associated with dissolved organic material in wastewater, would not be expected to be changed by the filtration process. Total BOD is reduced from 150 ppm to 70 ppm, a reduction of more than 50 percent. Approximately 90 percent of effluent water can be recovered by treatment with VSEP.

A process schematic for this application is presented in figure 2. Wastewater from the laundry that had previously been routed to the sewer pit is pumped to the second floor of the laundry where it is routed through a shaker screen to remove lint and then into a holding tank. At the holding tank, water is withdrawn by the feed pump and pumped through the VSEP unit. The capacity of the shaker screen and pump at the sewer pit ensure that they can produce and handle flows in excess of 100 gpm for VSEP feed flow rates.

The holding tank is plumbed so that an overflow is routed back to the sewer pit. The volume of the feed tank is 300 gallons and provides some equalization capacity for the feed pump. The tank is sized so that water can flow by gravity from the shaker screen to the tank and also so that the filter feed pump will always have proper head (and a flooded suction). Float switches are provided in the tank to prevent the pump from running dry.

The permeate (filtrate) line out of the VSEP system will be split into two separate recycled water pipes; the flow through each line will be controlled by using manual valves. One line will route recycled water to the tempered water tank and the other line will route water to the cold water tank. The recycled water is expected to have pH of 9.5-10 and a temperature of 90˚F-110˚F. A multi-stage centrifugal pump supplies water to the VSEP system at flows ranging from 50-100 gpm and a variable frequency electronic drive is provided. This kind of drive acts to control the rotational speed of the pump, thus controlling the flow rate.

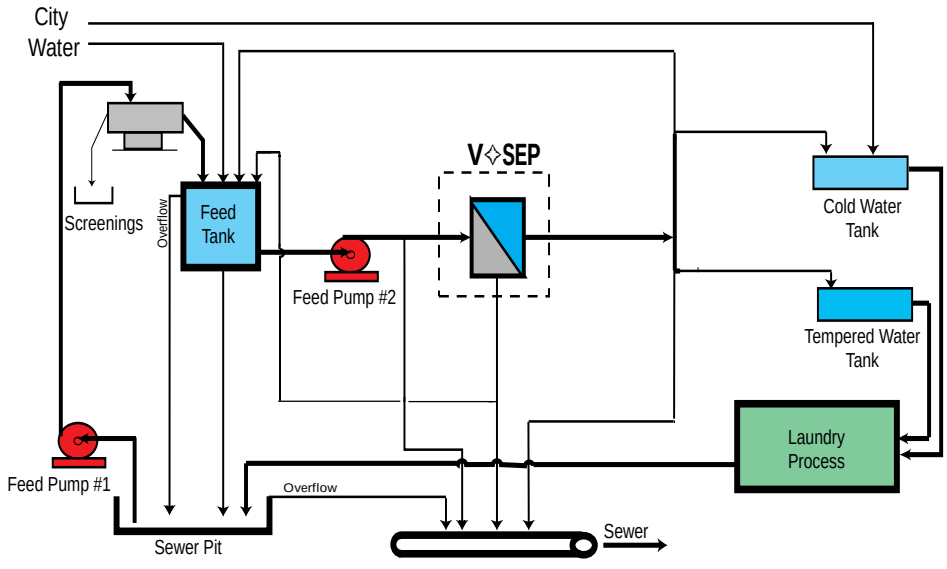


Figure 2. Process Schematic Diagram
Industrial Laundry Facility

Project Economics

The cost of installing and operating the VSEP system with the related savings that would be realized at different water recycle rates from reduced water usage and sewer charges has been developed.

Operating costs are calculated based on the power costs to operate the filter unit (20 HP), filter feed pump (15 HP), self-priming pump (5 HP assumed), filter cleaning cost, filter replacement cost and additional water heating costs that will be saved (due to the reduction of water that does not need to be heated). Results from the operation also point to the additional savings that result from the reduction in the use of detergents. The reduced detergent requirements result from the lowered hardness of water that is accomplished by the VSEP system and from the recycling of a significant portion of the dissolved detergents with the recycled water stream.

Operating costs are presented in Table 2 and include the cost savings that would be realized at different recycle rates. The water and sewer costs are based on rate information from the City of Seattle (water) and King County (sewer). At higher recycle rates, the effluent BOD, TSS and oil and grease concentrations would be high enough to trigger high strength waste surcharges. These surcharges would be offset, to a large extent, by the reduced water and sewer volume charges that would result from the higher recycle rates. The concentrations at which the high strength waste surcharges start are 300 mg/l for BOD, 400 mg/l for TSS and 100 mg/l for oil and grease.

A higher recycle rate of 80 gpm would result in a pay back period of as low as 11 months.

TABLE 1: ECONOMIC ANALYSIS ESTIMATE

Recycle Flow	City Water Flow	Total Water and Sewer Charge	V✧SEP O&M Savings	Net Water and Sewer Charge	Annual Savings	Payback Period
(gpm)	(gpm)	($/year)	($/year)	($/year)	($/year)	(months)
0	100	218,000		218,000	0	
50	50	103,300	(25,200)	78,100	139,900	17
60	40	79,300	(27,700)	51,600	166,400	14
70	30	62,400	(33,400)	29,000	189,000	12
80	20	37,400	(39,000)	(1,600)	219,600	11

TABLE 2: ESTIMATED OPERATION & MAINTENANCE COSTS AND SAVINGS

Item	Additional Costs	Savings
V✧SEP Power Consumption (30 KW @ $0.38/ KWh)	$6,600/year	
System Maintenance and Cleaning	$6,200/year	
Heating Savings (70 gpm from 60˚F to 100˚F=224 therms/day 81,800 therms/year @ $0.32/therm)		26,200/year
Detergent Savings		$20,000/year
NET SAVINGS		$33,400/year

Technology and Applications

VSEP (Vibratory Shear Enhanced Processing) is a technology applicable to the treatment schemes for recycled effluent and/or water/wastewater treatment in various process industries. Developed by New Logic International, Inc. of Emeryville, California, the VSEP system can filter streams containing a variety of contaminants without the fouling problems exhibited by conventional membrane systems. The process not only filters suspended solids, but it also reduces or eliminates BOD, COD and color bodies. The result is a crystal clear, reusable water stream and a concentrated sludge.

Rather than simply preventing fouling with high velocity feed, VSEP reduces fouling by adding shear to the membrane surface with vibration. This vibration produces shear waves that propagate sinusoidally from the membrane's surface. As a result, the stagnant boundary layer is eliminated which increases the filtration rates.

As shown in Figure 3, the industrial VSEP machine contains several sheets of membrane which are arrayed as parallel disks separated by gaskets. The disk stack is contained within a fiberglass reinforced plastic cylinder. This entire assembly is vibrated in torsional oscillation similar to the agitation of a washing machine. The resulting shear is 150,000 inverse seconds, which is ten times greater than the shear in crossflow systems.

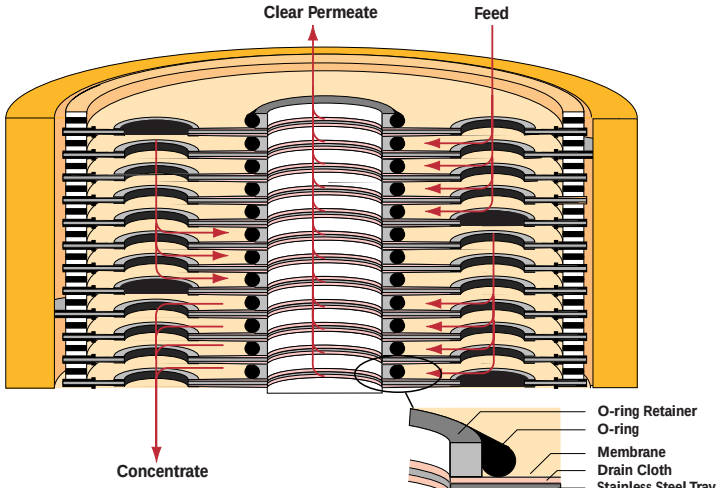


Figure 3:
Filter Pack Cross Section

This high shearing has been shown to significantly reduce the fouling of many materials. The resistance to fouling can be enhanced with membrane selection. Many membrane materials are available including polypropylene and Teflon. The patented VSEP membrane filtration technology was developed by Dr. J. Brad Culkin, Ph D. in 1987.

The major applications of New Logic's VSEP filtration technology include:

- Industrial & Institutional Laundries (wastewater treatment & water recyling)
- Product Dewatering and Solids Separation (various industries)
- Pulp and Paper (whitewater, bleach plant effluent, box plant effluent)
- Electronics Manufacturing (heavy metals recovery)
- Chemicals Manufacturing (calcium carbonate washing and concentration)
- Oil Production and Processing (produced water filtration)
- Paints and Pigments (paint concentration, latex recovery)
- Inks and Dyes (flexographic inks and starch concentration)

For more information about the Hospital Central Services installation and other VSEP applications, please contact:

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