

Revolutionary Technology Cuts Biosolids Production and Costs

A growing number of U.S. municipal and industrial wastewater treatment plants (WWTPs) are no longer routinely wasting biological solids from their treatment processes. These plants use a process that combines conventional activated sludge treatment technology with a smaller, separate sidestream system to recycle and restructure the bacterial population until all

excess biological material is broken down and degraded. An interchange between the aerobic treatment process and the non-aerobic sidestream basin conditions the bacteria for solids reduction.

In a conventional activated sludge plant, waste sludge typically undergoes some degree of thickening and/or dewatering prior to being hauled from the facility for

final disposal. The handling and disposal of biological waste sludge is typically the largest single cost component in the operation of a WWTP.

The Cannibal™ solids reduction process¹ eliminates some of this biological wasting. A portion of the return sludge is pumped to a sidestream bioreactor where the mixed liquor is converted from an aerobic-dominant population to a facultative-dominant population. By carefully controlling the environment, aerobic bacteria are selectively destroyed in this sidestream reactor while enabling the low-yield, facultative bacteria to break down and use the remains of the aerobes and their byproducts.

Mixed liquor from the bioreactor is recycled back to the main treatment process. There, the facultative bacteria, in turn, are out-competed by the aerobic bacteria and subsequently broken down in the alternating environments of the aerobic treatment process and the sidestream bioreactor. Essentially, the Cannibal process develops an equilibrium between selection and destruction in the side stream bioreactor and the main treatment process, thus producing no net biological solids. **Figure 1** depicts the Cannibal process flow sheet.

A patented solids separation module on the return sludge line removes grit and other inert materials. All of the return sludge is pumped through this module and recycled back to the main treatment process. Only a portion of this flow is diverted to the sidestream bioreactor for the selection and destruction process.

Biological solids do not build up, nor do they require routine or traditional wasting. However, the system does require an occasional purge to remove the build-up of fines and inert materials that are not removed through the solids separation module.

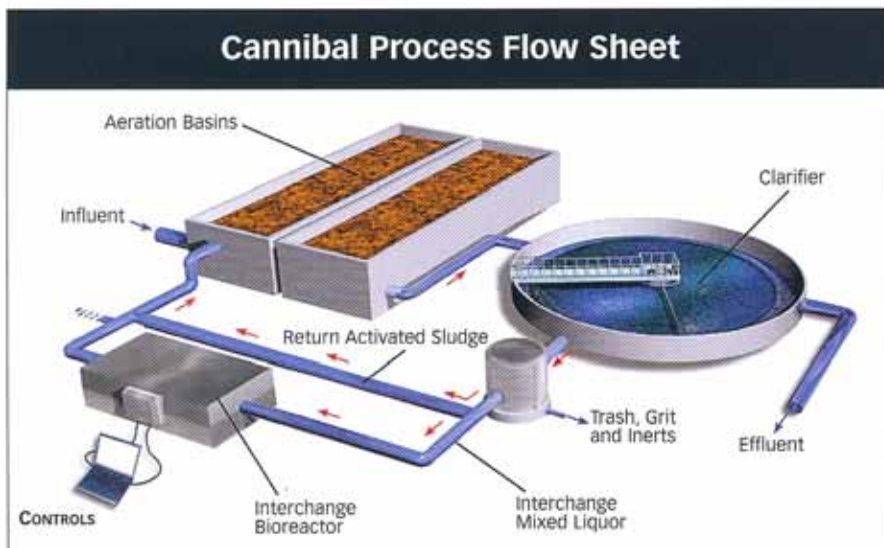


Figure 1

Annual Cannibal Process Savings - 1.5 MGD Facility		
	Without Cannibal Process	With Cannibal Process
Power for aerobic digester (\$0.15/kW-hour)	\$37,800	\$1,050
WAS disposal (\$37/wet ton)	\$168,200	\$18,410
Screenings/inert disposal (\$37/wet ton)	\$0	\$13,250
Polymer for dewatering (\$25/dry ton)	\$14,260	\$1,560
Labor for dewatering (\$33/hour)	\$68,640	\$1,030
Power for solids separation module (7 Hp total)	\$0	\$5,430
Power for mixers in sidestream tanks (31 Hp total)	\$0	\$2,540
Net operational savings:	\$245,600 per year	

Table 1

	Flow (MGD)	Influent BOD mg/L	Effluent BOD mg/L	Effluent TSS	MLSS mg/L	Biosolids Wasted, lbs.
2000	0.330	250	3	7	4,950	0
2001	0.373	246	4	9	4,500	0
2002	0.369	225	4	16	4,550	0
2003 Jan.-Sept.	0.469	220	3	7	3,800	8000*

Table 2

Life cycle cost savings

In addition to reducing the costs of hauling biosolids to an appropriate disposal facility, reducing the amount of biosolids can also lighten the burden on a plant's power and labor costs from aerobic digestion and dewatering systems, as well as eliminate the cost of using polymers. Table 1 summarizes the potential operational cost savings for a typical 1.5 mgd WWTP.

Operating results – municipal plant

A 1 mgd sequential batch reactor WWTP in Georgia began using the Cannibal solids reduction process in October 1998. The plant has only purged solids once in five years to relieve the plant of extremely fine inert material build-up. Table 2 presents operating data from the Georgia plant for the period of January 2000 to September 2003, during which 8,000 lbs of wasted biosolids were removed.

Solids destruction test – municipal installation

A 0.4 mgd municipal wastewater treatment plant in Illinois installed the Cannibal process in 2001. After initial start-up, the plant completely eliminated routine biomass wasting.

In summer 2003, research and development engineers from USFilter performed a 30-day investigation of the plant. The test had many objectives, including showing a solids mass balance. During the course of the test, the mixed liquor concentration remained relatively constant with no increase observed. Figure 2 shows the results of the test.

The only solids removed from the plant during the investigation were trash, grit and inert materials from the solids separation module and the effluent suspended solids. The line for solids removed from the plant shows a steep increase each time material was hauled from the solids separation module. The data suggest that there was no net biological solids production. Solids are

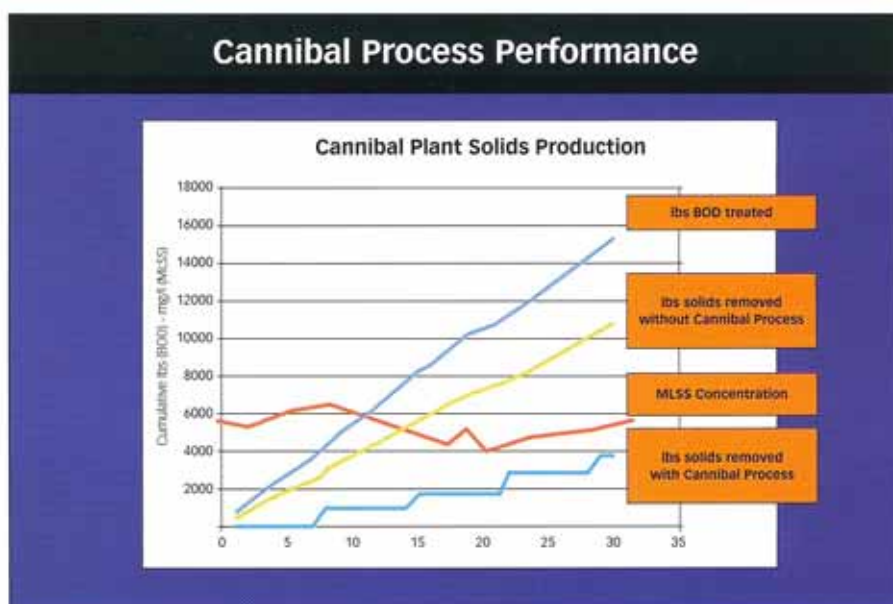


Figure 2

neither stored nor lost in the effluent.

Operating results – industrial plant

The Alpine Cheese Factory, located in Holmes County, Ohio, produces high-quality cheese products. High-strength wastewater is a byproduct of the process. Located in a small community, the plant must treat its own waste and discharge it to a local receiving stream.

The Cannibal process at the Alpine Cheese WWTP is designed for 25,000 gpd with an influent BOD of 3,000 mg/l and total nitrogen of 160 mg/l. However, the plant is currently operating at 39,000 gpd – more than 50 percent over its design load. The effluent averages 4 mg/l BOD and 12 mg/l TSS and achieves total nitrogen removal.

Since the dairy plant effluent is devoid of trash, grit and inert material, and all of the suspended solids are biodegradable, the process does not require a solids separation module. Sludge production from the plant is 0.04 lbs of solids per pound of BOD treated.

Conclusion

The Cannibal process can be incorporated into new and existing municipal and industrial wastewater

treatment plants. The technology reduces biosolids production as well as operating and capital costs. Installing the process does not require a large capital obligation and has the potential to significantly reduce operating expenses for WWTPs across the globe.

John Sheridan m.s. environmental engineering, is product manager for biological processes at USFilter Envirex Products in Waukesha, Wis. He can be reached at sheridanj@usfilter.com

Betty-Ann Curtis M.S. civil engineering, is director of biological processes at USFilter Envirex Products in Waukesha, Wis. She can be reached at curtisba@usfilter.com

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USFilter

USFilter Envirex Products
1901 S. Prairie Avenue
Waukesha, WI 53189

Ph: 262.547.0141
Fx: 262.547.4120
E-mail: Cannibal@usfilter.com
Website: www.usfilter.com