Municipal Applications:

The Mitcherson EcoSieve is an excellent alternative to conventional gravity settling filters. However there is more to the story than just replacing existing equipment, it can also be used to make existing systems more effective. EcoSieve can achieve 40-70% removal of total suspended solids (TSS) and 20-40% of Biological Oxygen Demand (BOD) in incoming municipal influents.[1,2]

Ideally the EcoSieve is placed just after the head works screening equipment and prior to secondary treatment. The EcoSieve solids discharge can be configured in one of two ways.

1. In the first configuration, the screw press is intact so that discharge is in the form of a dewatered cake with solids content between 30-40%. This is a very dry cake that can be easily hauled without the need for a liner in the transport vehicle.[3]
2. The alternative is to remove the screw press resistance which results in a sludge similar to primary sludge with a moisture content between 3-6%. By configuring the EcoSieve to discharge a sludge, the solids can be pumped directly to an anaerobic digester, as they would be in a conventional system and then converted to Class A stabilized bio-solids.

In Figure 1, a typical plant arrangement is shown with a primary clarifier and an anaerobic digester.

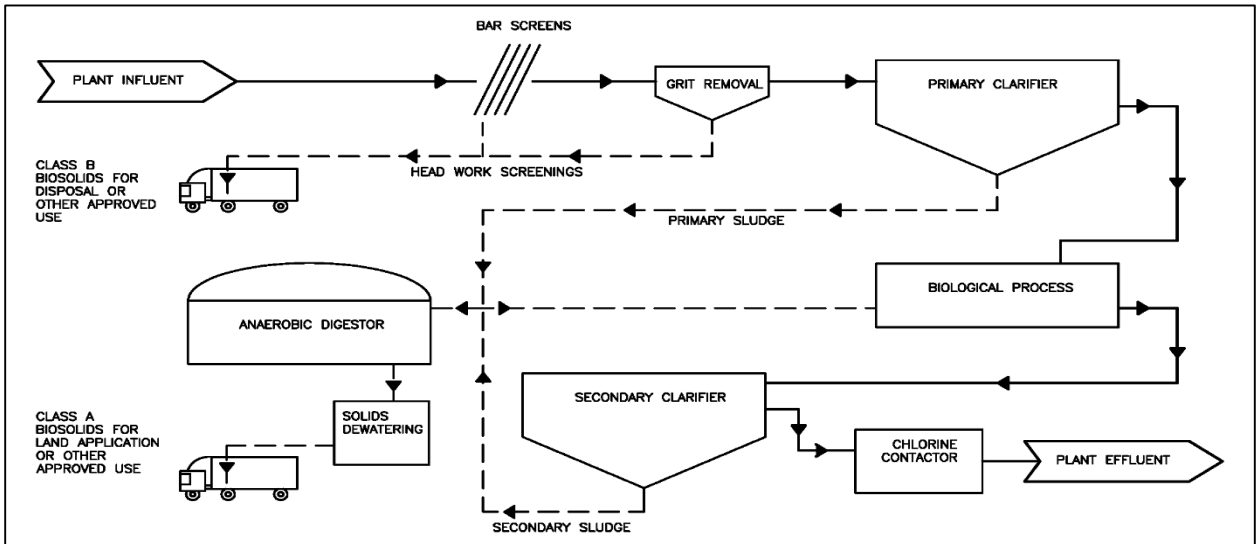

FIGURE 1 – CONVENTIONAL PLANT WITH PRIMARY CLARIFIER

[1] The given removal rates are typical for medium strength municipal waste water ranging from 200-300 mg/L of TSS and BOD5 ranging from 150-250 mg/L[2]

[2] *BOD5 refers to the particular BOD measurement expressed in milligrams of oxygen consumed per liter of sampling during a 5 day incubation period*.

[3] It should be noted that these are Class B bio-solids and should be disposed of in accordance with local laws

Figure 1A shows the EcoSieve replacing the primary clarifier in this configuration.

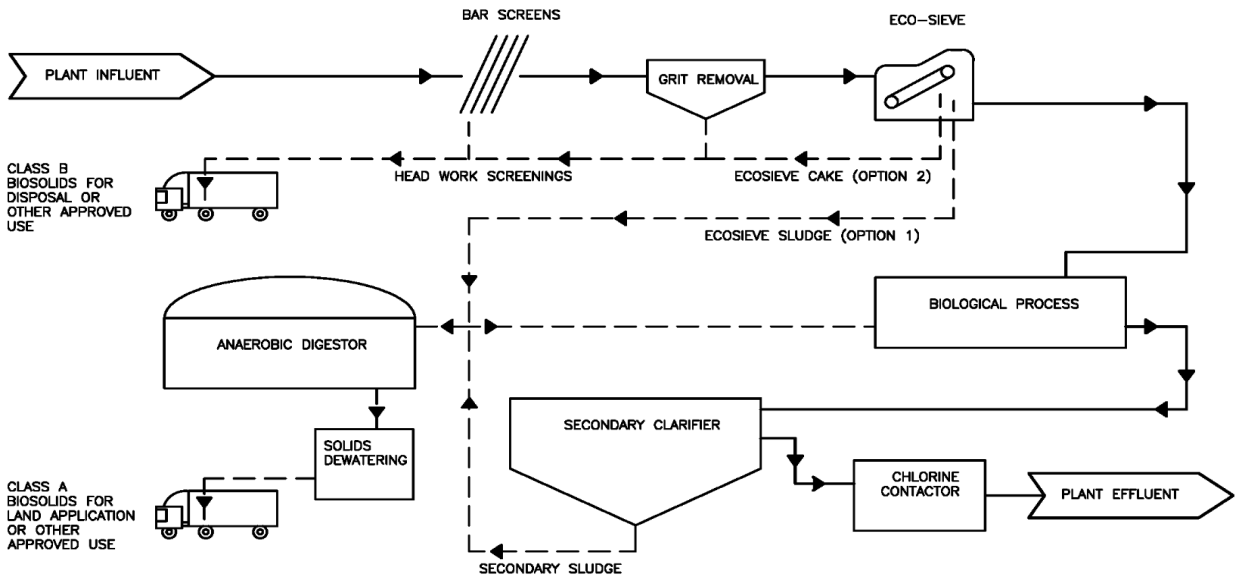

FIGURE 1A – CONVENTIONAL PLANT WITH ECOSIEVE

However, the EcoSieve could also easily work in parallel or series with existing clarifiers. The EcoSieve only occupies a fraction of the real estate that typical gravity filters require (usually around 1/10th of the footprint), so finding a suitable location to install an EcoSieve is easy without having to demolish existing equipment. If there is no primary treatment in the plant for example where an oxidation ditch is installed, EcoSieve can help reduce the load on the entire plant.

Figure 2 : Typical oxidation treatment arrangement.

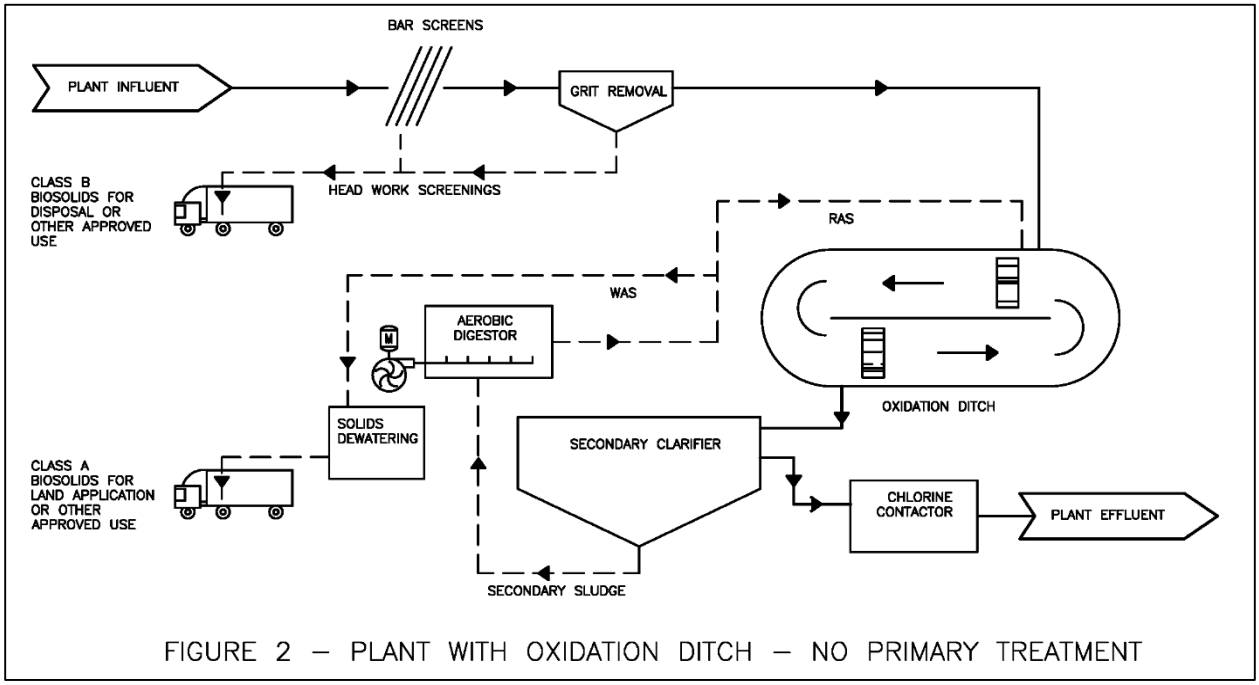

FIGURE 2 – PLANT WITH OXIDATION DITCH – NO PRIMARY TREATMENT

Figure 2A : Suggested placement of an EcoSieve.

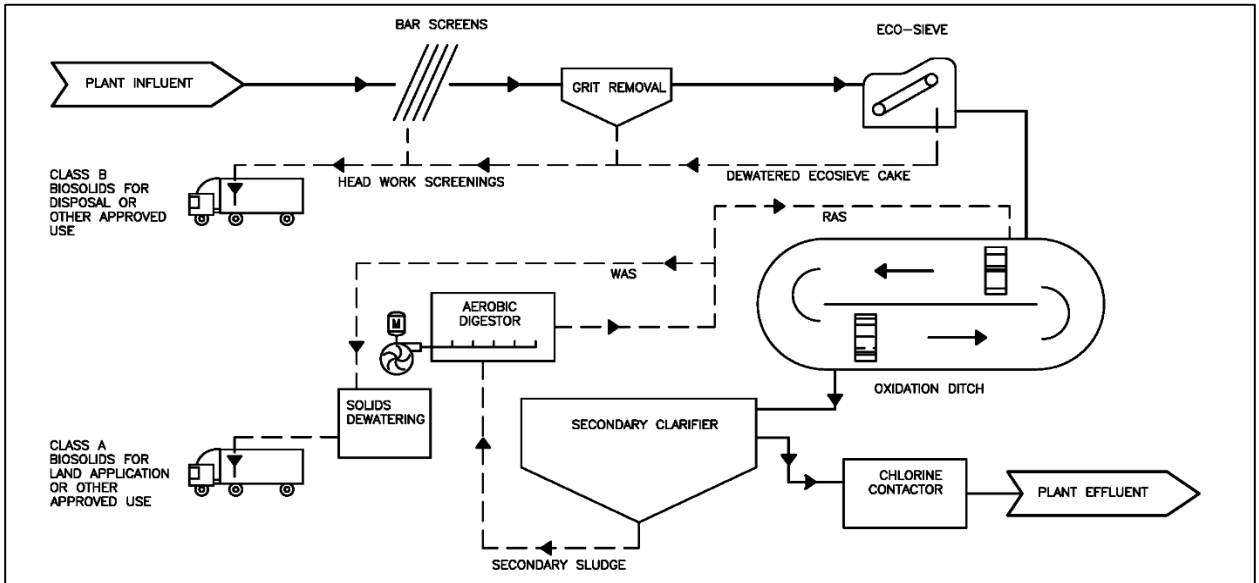

FIGURE 2A – PLANT WITH OXIDATION DITCH AND ECOSIEVE

By removing approximately 40%-70% of the solids and 20%-40% of BOD, the load on the plant is significantly reduced. In fact, installing an EcoSieve in front of any waste water plant will significantly relieve the plant of solids loading and improve performance and reduce operating cost. Consider a lagoon system that is overloaded. Simply installing an EcoSieve in front of the lagoons could reduce the load and avoid costly plant expansions.

Possibly one of the most advantageous features of the EcoSieve is the ability of its design to eliminate all carry-over downstream of the filter, making EcoSieve an ideal pretreatment for MBR or other sensitive treatment processes. Carry-over is common to self-cleaning filters when incomplete cleaning allows residual material left on the filter media to be carried downstream of the filter. The EcoSieve directs the filtered liquids away from the filter media and eliminates the possibility of any remaining residual material left on the filter that may cross contaminate the filtered effluent.

Example Solution

The following is an example of the EcoSieve performance and how it could affect a plant.

Let's assume that a plant experiences an incoming TSS load of approximately 275 mg/L of TSS and 240 BOD 5 mg/L. A Lift station pumps approximately 800 GPM 50% of the time. The average flow is 400 GPM, but the EcoSieve needs to be able to handle the 800 GPM. The ES-1800 would handle this flow in a typical municipal application. Let's assume we are using a 200 micron sieve belt and removing on average 60% of the TSS and 20% BOD. The screw press is included to provide a solids cake that is approx. 33% solids.

Example Calculation of Results:

TSS removed: 275 mg/L x 60% = 165 mg/L
TSS of EcoSieve effluent: 275 mg/L – 165 mg/L = 110 mg/L
Average Flow: 400 GPM = 90,850 L/h
Dry Weight of solids removed = (90,850 L/h) x (165 mg/L) x ($2.204623x10^{-6}$ lbs./1mg) = 33.05 lbs./h (dry)

Because the cake will still have 67% water retained, the actual weight of cake is 100 lbs./h (actual)
BOD removal is assumed to be 20%, therefore effluent BOD is reduced from 240 mg/L to 192 mg/L

Filter Belt Particle Removal

In addition to removing a significant portion of the solids loading on the plant, EcoSieve also eliminates all particles larger than 200 microns and a significant number of particles smaller than 200 microns. This is because particles tend to create a mat on the sieve belt and block additional smaller particles. This creates a normalized effluent from the EcoSieve and gives the operators much more control over the size of particle allowed into the plant.

Filter belts are available in many different sizes ranging from 100-800 microns. By eliminating larger particles from the effluent, it helps the biological process further by eliminating hard to consume large particles. Another consideration when installing an EcoSieve in an existing system will be the need to ensure enough food for the bacteria is allowed into the plant to prevent certain bacteria populations from starving. Adjustments on belt size, once again can help fine tune the removal rates to achieve optimal performance.

Industrial Applications:

When evaluating industrial applications it should be noted that higher concentrations of TSS can often result in higher removal rates. Solids that are introduced into industrial waste water may have uniform size. When waste water is treated on-site, there is a shorter distance that the water needs to travel and therefore the primary treatment may begin sooner than in municipal applications. This results in less dilution and breakdown. Treating fresher, more uniform high concentration solids can often lead to higher removal rates of TSS, BOD, FOG and other key parameters.

TSS removal in high strength industrial waste water has been observed in the upper 90 percentile, BOD more than 70 percent, and FOG more than 80 percent.

Due to the different varieties of applications in the industrial applications, it is difficult to pin point specific performance expectations without first performing a pilot test to determine the effectiveness of the technology. The following are some known industrial applications where sieve screening technologies have proven to be effective.

Meat Processing

This may involve Stockyard wash-downs, slaughter, evisceration and boning, casing production, and rendering. The United Nations Environmental Program, *Cleaner Production Assessment in Meat Processing (2000),* estimates that 1,100 to 4,400 gallons of water are used per live weight ton of processed animal in the United States.

The Meat Research Corporation published a study of Australian abattoirs in 1995 that estimated the following water consumption breakdown in Beef and Pork process operations.

Meat Processing Activity	Percent of water usage	Typical Range for (TSS) mg/L	Typical Range for Chemical Oxygen Demand (COD) mg/L
Stockyard wash-downs and animal watering	7-22%	300-1,500	1,000-2,200
Slaughter, evisceration and boning	44-66%	400-800	1,000-3,000
Casings production	9-20%	500-1,000	500-800
Rendering	8-38%	6,000-35,000	15,000-100,000
Domestic uses	2-5%	50-200	300-800
Chillers	2%	50-200	300-800
Boiler losses	1-4%	50-200	300-800

Table 1 - Meat Processing Wastewater Characteristics (MRC, 1995)

Meat processing waste water differs from municipal sewage because it is usually high strength waste water, highly degradable at elevation temperatures, and waste products can be economically recovered (MRC 1995). Primary treatment is the key to a good wastewater treatment system.

Typical primary treatment tools in this industry have commonly been Screening, Sedimentation Tanks and Dissolved Air Floatation (DAF). Screening is usually performed by static screens, vibrating screens or rotary screens where rotary screens are the most commonly used. Rotary screens are usually specified with 0.4mm openings with a possible range from 0.1mm to 2.0mm. The problem with this screen type is that they tend to block due to fat accumulation. Metal screens are difficult to keep clean because of the tight clearances between the screen structural wires.

EcoSieve can surpass the capabilities of existing technology.

EcoSieve thin fine mesh screens are designed to provide ease in cleaning. They operate efficiently with smaller openings that are mesh instead of slotted, therefore animal hair and other fibrous debris does not clog, as they can with a conventional screen.

Poultry processing plants

Waste water in poultry processing plants will be similar to the meat processing industry however there are some additional sources for waste streams. Water, in addition to being used for carcass washing and cleaning, is also used for: hot water scalding prior to defeathering; water flumes for transporting product; and for chilling. Water consumption rates vary from 4,000 to 24,000 gallons per 1,000 birds processed (Hrudey, 1984).

In this water intensive sector, waste streams are high in solids that need to be removed efficiently. The EcoSieve brings a whole new level of efficiency to the industry and is the clear choice for solids removal.

Fish Processing

In this industry, water use varies significantly from 1 to 4 gallons per pound of processed fish. Sources of wastewater include fish storage and transport, cleaning, freezing and thawing, preparation of brines, equipment sprays, offal transport, and equipment and floor cleaning. General cleaning contributes significantly to total water consumption, making the smaller operations have higher water use per unit of production. Contaminants include blood, offal products, viscera, fins, fish heads, shells, skins, and meat "fines". Depending on the type of fish processing operation, waste water can vary in strength from high strength waste water with TSS of 500 mg/L and BOD of 700 mg/L to extremely high strength waste water with TSS up to 30,000 mg/L and BOD up to 30,000 mg/L. Fats, Oils and Greases FOG are usually high ranging from 10 to 20,000 mg/L depending on the type of operation (Colic & Morse, 2007).

Typical primary treatment processes for seafood processing are flow equalization, screening, sedimentation, the pH adjustment, flocculation – flotation and microfiltration. It is normal for fish processing units to provide stationary screens, rotary screens or drum screens at the beginning of primary treatment. Stationary 1mm screen openings are a popular choice and usually remove between 30-80% of the solids (Colic & Morse, 2007). Smaller screen openings tend to clog.

EcoSieve can surpass the capabilities of existing technology.

EcoSieve allows screening significantly finer than conventional screens, down to 0.1mm without choking the flow. By using a finer screen, more solids are removed during screening therefore allowing for savings to be realized by reducing the demand for costly treatment chemicals such as coagulants and flocculants. Because of high FOG a hot water cleaning cycle would be recommended in these applications.

Beverage and Fermentation Sector

The fermentation sector is recognized for having challenging wastewater issues and potential for serious pollution if not treated properly. Solid waste results from spent grains and other materials used in the fermentation process. Distillery raw waste water can have extremely high TSS (2,000-14,000 mg/L) and BOD5 (25,000-75,000 mg/L). Raw waste water volume produced in the distillation process maybe as much as 14 times the actual product volume produced.

Typical Brewery raw waste water will have TSS around 5,000 mg/L and BOD5 around 10,000 mg/L. Raw waste water produced in breweries will be 2 to 4 times the amount of beer produced. Wineries will have seasonal fluctuations in waste water processes. During the pressing and processing season, winery wastewater may have TSS concentrations ranging 150-5,200 mg/L and BOD5 concentration ranging 300-12,000 mg/L. Raw waste water produced in wineries will be 4 to 5 times the amount of wine produced.

Removal of solids in the fermentation industry is necessary and the EcoSieve is perfectly suited to reduce large quantities of solids loading early in these type wastewater treatment applications which will significantly improve all downstream processes and create an overall better and more efficient treatment system.

Food Processing Industry

The food processing industry covers a wide spectrum of types of foods including canned meats, frozen dinners, cereal, soups, bakery products, sauces, and much more. There are too many different types of food processors with unique needs, that it would be difficult to appropriately categorize them all. They do, however, have generalized sanitation requirements that generate significant waste water.

Many of these plants discharge to local municipalities some will have their own permits to discharge directly to the environment. Clean-up is always involved in meeting sanitation requirements in the plant, so it is very common for food processors to have strong waste water with significant TSS and BOD in their water along with other pollutants that may play a significant role in the type of pre-treatment selected. Plants that produce many different products in batch cycles (including the cooking of food) will have significant waste water generated in clean-up cycle in-between switching products.

A majority of food processors will utilize gravity settling and floatation prior to discharge to a municipal system. Some plants will have screening and other plants will include secondary treatment and possibly tertiary treatment. The extent of treatment will be governed by the discharge requirements and the economics of installing and maintaining treatment systems. Often food processors will pay discharge fines to the local municipality and attribute fines to the cost of doing business.

As the EPA tightens discharge requirements, the cost of treating waste water goes up and eventually will be passed on to the food processor. It then becomes the dilemma of the food processor to determine if they want to be proactive in reducing their discharge load before fines are increased or make capital expenditures in advance to comply with tightening restrictions.

Whatever the case, the EcoSieve provides plant operators with an economical pre-treatment solution to work in series or parallel with existing equipment or to completely replace obsolete equipment. The small foot print becomes extremely advantageous in a mature plant where space comes at a premium.

Fruit and Vegetable Processing

Waste water processing in this industry involves general cleaning and dirt removal, blanching, washing and cooling, and clean-up. Water used for these activities often contains significant solid waste as a result of these activities and is a primary source of pollution and an excellent opportunity for an EcoSieve to capture solids prior to further treatment or plant discharge.

Fish Hatcheries and Farms

In a properly managed farm, approximately 30% of feed distributed will be converted to solid waste. Primary treatment should be performed as soon as possible to prevent waste fragmentation which could result in leaching of nutrients into the water (Miller and Semmens 2002). Typical methods for removing solids start in the design of tank where flow is controlled and low velocity sections collect settled solids. Settled solids are then pumped to a filtration unit consisting usually of drum, disk, bead or sand filters. Efficient tank designs can minimize flows, however relatively high filtering flows are usually necessary for good filtration.

The high capacity of the EcoSieve with a small footprint excels in this type of application. Depending on installed equipment, the EcoSieve can work in series or parallel to existing equipment or can replace obsolete equipment.

Pulp and Paper

This is a complex industry that is very water intensive. Water that is used is frequently recycled. Water treatment is integral to this industry. Primary treatment usually includes neutralization, screening, sedimentation and occasionally floatation / hydrocycloning to remove solids.

Here, the EcoSieve can play a role in improving existing systems or reducing loads were expansions are necessary with little space.

Tanning

Tanning is the process of treating skins of animals to produce leather. Tanneries present some challenging industrial wastewater problems. Manufacturing processes include washing and soaking, degreasing, unhairing, bating, pickling, tanning, retanning and finishing. Raw wastewater will have different characteristics depending on the category of process they fall in.

Typical tanneries wastewater can have TSS loadings from 800 mg/L to 10,000 mg/L. BOD5 range from 700 mg/L to 7,000 mg/L. Tanneries will usually have primary and secondary treatment prior to discharge in order to address the unique characteristics of their waste water. Tanneries typically perform screening in the first steps of their primary treatment. Coarse bar screens from 20mm to 6mm are typically used then followed by fine rotary drum wedge wire style screens.

EcoSieve can surpass the capabilities of existing technology.

The EcoSieve is a superior choice is this application because of the fine thin polyester mesh's ability to avoid being fouled. In comparison, mechanical screening with metal wire screens present challenges because screens are subject to clogging.