INTRODUCTION

This paper addresses the needs of the septic tank pumper. Historically the pumpers themselves have been responsible for those wastes they put into their tank trucks. For years a high percentage of these wastes have been deposited upon the land. Not always for its beneficial reuse – usually just for disposal, and sometimes under some permitting scenario but often under no regulatory oversight at all. With the promulgation of the Federal 40 CFR Part 503 regulations in 1993 a movement began towards legitimate beneficial reuse of septage, but progress has been slow. Today ‘illegal’ (at least not permitted) land application of septage and grease trap wastes accounts for more gallons disposed than many want to admit.

In areas where neighbors forced a pumper out of the land application business wastewater treatment facilities started taking their waste streams, usually not of their own (wastewater treatment facility’s) desires but because of intervention by a local politician. The charge to the haulers was usually based on what was acceptable to the haulers rather than any rational relationship to the costs associated with the treatment of these wastes. The idea was to encourage use of the wastewater treatment facility and discourage illegal dumping on the land or into a remote manhole somewhere in the collection system. Wastewater treatment facilities got in the habit of accepting these wastes and acknowledged that all they accepted was septic tank waste (septage) since grease trap and car wash wastes cause them operational and compliance problems. The haulers, being a creative bunch, have gotten very good at camouflaging almost anything to the point they can rationalize calling it ‘septage’.

Regulated management programs for household septic systems and food service facility grease traps are on the rise. With these programs comes an increase in volume of these wastes needing to be properly treated and dispersed into the environment. The United States Environmental Protection Agency has stated that they believe there is only 50% of the treatment capacity available in this country for all the wastes that will be generated when regulated management programs take effect. Clearly there is a need for dedicated facilities able to accept those wastes that the septic tank pumpers like to put into their trucks.

For dedicated facilities, either publicly or privately owned, to be sited there are a few parameters that must be evaluated.

---

1 Tom Ferrero is a consultant with Ferrero & Associates, LLC and Chief Operating Officer of United Wastewater Management, Inc. United is committed to developing, constructing, owning, and operating septage, grease trap, and grit trap treatment facilities for the industry. The facility described in this paper is the United Wastewater Recovery Center of Elkhart located at 1143 Oak Street in Elkhart, Indiana. 574.266.7571
First, from a cost standpoint these facilities are very affected by the volume of waste they handle. While the incremental cost of treating one gallon of waste may be similar, the high capital intensity of these facilities makes them not affordable in areas where low volumes are produced. Extremely rural areas may have to accept the fact that these wastes must be trucked a considerable distance to the nearest facility. Conversely, high volumes help reduce the cost per gallon charged to the haulers.

Secondly, there needs to be a reasonable competitive marketplace. If the local wastewater treatment facility is charging the haulers less than actual treatment costs to accept their septage the area is not conducive to siting a facility that will accept septage and other waste streams. Since the volumes of septage will be the foundation of revenue for these facilities (septage volumes usually are three or four times the grease trap waste volumes in an area) a facility will not be affordable to users if they cannot attract a large percentage of the waste volumes generated in the area.

And lastly, there must be the support of the regulatory agencies that will permit and regulate the facility and a political mindset that appreciates the need for such a facility. It is always easier for the politicians to say ‘Not in my backyard!’, but many take their responsibilities seriously and can become strong proponents for the project.

CASE HISTORY

Several factors dictated that more treatment capacity was needed for septage and grease trap wastes in northern central Indiana.

First, St. Joseph and Elkhart counties are the state’s highest septic system populated counties. As of the 1990 Census, St. Joseph County has in excess of 28,000 septic systems, with Elkhart taking second place with more than 27,000 septic systems. No one knows the exact number but growth over the last decade would indicate that these numbers are considerably higher today.

Second, treatment capacity for septage was limited and often many miles from where the wastes were generated.

And, lastly, there was no consistent legal treatment for grease trap wastes in the area.

The facility needed to be permitted both by the Indiana Department of Environmental Management (IDEM)(Permit to Construct) and the City of Elkhart (Industrial User Discharge Permit). IDEM shared the vision of such a facility and had a permitting scenario that was not cumbersome. The IDEM permit was issued in less than two months after submission. Partnering with the City of Elkhart Board of Public Works, United Wastewater Management (United) resurrected a mothballed pretreatment facility owned by the City and turned it into a merchant facility that accepts septage and grease trap wastes. In addition to leasing the facility to United, the City invested in capital improvements to the project in the form of a five year note with United.

About twenty years ago in the Philadelphia suburbs I raised the question, “How do you get septage into a wastewater treatment facility that does not accept septage?” I found that there was a
document called a sewer use ordinance that clarified what could and what could not be discharged into the municipal collection system. Direct discharge of septage into the municipal collection system would surely not meet the criteria of any sewer use ordinance in the country. But by pretreating the septage to the point where an effluent is created that does meet the sewer ordinance it is possible to get an industrial user discharge permit that will allow for discharge of all but a small percentage of the total volume.

The United facility in Elkhart, Indiana is a permitted industrial user of the City of Elkhart municipal collection system. The process at the facility is to manage the input from the local septic haulers by a sampling protocol, manifest system, recordkeeping, screening and grit removal, flow equalization, chemical conditioning and dewatering. The filtrate from the belt filter presses is further clarified and discharged to the municipal sewer collection system under an Industrial User Discharge Permit. Currently the sludge cake is being landfilled. Figure 1 gives an overview of the process flow.

![Figure 1 - Process Flow](image)

The flow equalization tanks and belt filter presses were in place. Upgrades to the facility were mostly for the receiving station which includes a containment area, automatic screening, and grit removal. A containment area is necessary in the area where the trucks are off loaded. Every time the haulers remove the cap from their discharge valve they lose some material onto the ground. Sometimes it is a few drops, other times it could be a few gallons. Everything that falls onto the ground is rinsed down and ends up in the treatment process. Spill containment was one of IDEM’s firmest requirements.

Sampling protocol consists of monitoring every load that discharges into the facility. The discharge flows through an open channel where the facility operator can see and smell what is being discharged. The policy is that if the waste is reported to be septage and it looks like septage and smells like septage it probably is septage. Similarly, if the waste is reported to be septage but it looks and smells like grease trap waste then a sample is taken and the discharger may be surcharged for the analytical charges and additional treatment fees that apply to grease trap wastes. Loads will be rejected if the material does not look and smell like septage or grease trap waste. Since the
hauliers understand the close scrutiny of every load there has been no reason, to date, to surcharge or reject any loads.

While not required by any regulation, the facility has implemented a manifest system. Each load is documented by the haulers as to the source, type, and volume of the discharged material. Mixed loads, that is loads with both septage and grease trap waste, are accepted and documented accordingly on the manifest. The input volume is recorded by use of an inline flow meter. The haulers are invoiced on a gallonage basis every week.

The first unit process is screening of the material. Automatic screening is accomplished by a Lakeside Fine Screen. There are many products on the market today for screening septage, but most become blinded with the grease that accumulates in septic tanks (much less what accumulates in restaurant grease traps!). The Lakeside Fine Screen is an excellent unit for this application. While the unit may allow more small particles to pass through the screen it does an excellent job at removing the larger debris that takes up space in tanks and clogs pumps. A less expensive manual bar screen could have been used instead of the automatic fine screen but the concern for our employees health and well-being precluded such an option.

The next unit process is grit removal which is accomplished through the use of a grit classifier. Be assured that these wastes are loaded with grit. If you do not address it up front, you will surely address it when pipes and pumps clog with grit and tank space is overwhelmed with grit. Removing it from these spots is not fun job!

Onsite were two 70,000 gallon sludge holding tanks with 20 hp mixers. After flowing through the screening and grit removal equipment the waste is accumulated in these tanks. This is necessary for two reasons. One, it attenuates the flow from the tank trucks which discharge at a rate between 200 and 300 gallons per minute (we press at about 100 gallons per minute). Two, the components of each truck load vary but the blended average is very consistent. This is important for conditioning and dewatering the material.

The blended waste stream is then conditioned with polymer and dewatered using the two 2 meter Von Roll belt presses that existed in the facility. Although years ago we said septage and grease trap waste could not be dewatered, the technology of today has advanced the state of polymers and dewatering equipment to make it doable. Blends with up to 30% grease trap waste by volume are easily dewatered. The sludge cake produced is about 25% solids on a dry weight basis. Currently the sludge is landfilled since the facility has no means of further treating the sludge to produce a beneficially reused biosolid. Unfortunately landfill tip fees are relatively inexpensive in northern Indiana so the capital investment necessary to produce a Class A or B biosolid cannot be justified.

Capture on the belt presses is not as good as one would like to see. Therefore, we send the filtrate through several clarifiers prior to its discharge into the municipal collection system. On a schedule settled solids are pumped back from the clarifiers into the equalization tanks. The facility Industrial User Discharge Permit requires self monitoring and reporting of the effluent quality. Some parameters are measured monthly, others quarterly, some semi-annually, and a few on an annual basis. The original monitoring requirements were more extensive but a good compliance history
allowed the City to reduce some of these requirements. There had been concerns that our discharge would not meet the FOG requirement of less than 100 mg/l, but in fact our discharge has never exceeded 20 mg/l! Of the parameters for which we are surcharged, BOD averages about 500 mg/l, TSS is always less than 50 mg/l, ammonia-nitrogen less than 50 mg/l, and phosphorous less than 25 mg/l.

The facility had previously been used to pretreat high strength pharmaceutical wastes and had a poor track record for odor problems. Septage and grease trap waste pretreatment is also an odor generating operation and neighbors voiced their concern. United had known from the start that odor management was a prerequisite to opening the facility. All unit processes are located in a building. Trucks unload through a 4” discharge hose connection that terminates inside the receiving building. The only piece of equipment outside is the sludge rolloff.

Odor is managed by the use of an existing blower that evacuates air from the press room, receiving area, and vents on the equalization tanks and clarifiers. The existing wet stack scrubbing system was ‘scrubbed’ in lieu of installing a 2500 square foot biofilter. Previous experience with biofilters with their associated low costs of construction and operation led to this odor management process. Also, the thoughts of bringing ‘unnatural’ chemicals on site did not appeal. The few odor complaints that the facility has had were all prior to the finished construction of the biofilter. Most of these complaints were caused by careless operator management. One example is the practice of cleaning the clarifiers with a vacuum truck while neighbors were working outside about 50 yards downwind! Pumps have been installed to move the settled solids back to the equalization tanks without the venting of fowl air. Once the neighbor called with an odor complaint when no abnormal operations were taking place. The operators were surprised to find one of the haulers had stopped to wash his truck with smelly facility effluent water! These and other examples are proof that best management practices are vital to odor management.

For recordkeeping and invoicing United uses an internet based database to compile all input and output data. Information is kept regarding the sources of every gallon that enters the facility and the final deposition of the sludge cake produced. The software is evolving. The goal is to allow access to this data by regulators, customers, and waste generators over the internet.

**COST OF TREATMENT**

Septage has highly variable characteristics. Data generated by the US EPA during the development of the 40 CFR Part 503 regulations regarding land application of septage is shown in Table 1.

<table>
<thead>
<tr>
<th>Parameter*</th>
<th>Range</th>
<th>Average</th>
<th>Suggested design value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD&lt;sub&gt;5&lt;/sub&gt;</td>
<td>440-78,600</td>
<td>6,500</td>
<td>7,000</td>
</tr>
<tr>
<td>TSS</td>
<td>310-93,400</td>
<td>12,900</td>
<td>15,000</td>
</tr>
<tr>
<td>Ammonia-N</td>
<td>3-116</td>
<td>97</td>
<td>150</td>
</tr>
<tr>
<td>Total PO&lt;sub&gt;4&lt;/sub&gt;</td>
<td>20-760</td>
<td>210</td>
<td>250</td>
</tr>
</tbody>
</table>

Table 1   Septage characteristics<sup>1</sup>
Oil & Grease 210-23,400 5,600 8,000
pH 1.5-12.6 6.0
Copper 0.3-34 8.27 8.0
Lead 2-8.4 5.2 10
Zinc 2.9-153 27.4 40

*Reported in mg/l except pH which is in standard units

Merchant facilities can calculate the cost of treatment by dividing their total costs by the amount of gallons processed. Adjustments can, and should, be made for variable waste streams, i.e. grease trap wastes have two or three times the percentage of solids and organic strength as does septage. Assumptions must be made, and the results are never perfect, but at least a good attempt can be made at developing an equitable pricing structure. At the United facility pricing is five cents per gallons for septage and twelve cents per gallon for grease trap waste. Remember this is a privately owned merchant facility and a profit margin is incorporated into these charges.

A municipal wastewater treatment facility may have a greater task at developing a pricing structure. Since treating septage and grease trap waste is not all they do, there are an infinite amount of variables to consider.

One reasonable mechanism for calculating cost to treat septage is to use the existing sewer ordinance’s surcharging rates. Most municipalities already expend the effort to calculate these rates. And, this seems fair since that is what a municipality would charge an industrial user if that was the quality of the waste being discharged to the collection system.

Table 2 shows the rates the United facility pays the City of Elkhart for exceedences over a base level.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Surcharge Rate</th>
<th>In Excess of Base Level (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD&lt;sub&gt;5&lt;/sub&gt;</td>
<td>$0.1820 per pound</td>
<td>250</td>
</tr>
<tr>
<td>TSS</td>
<td>$0.3199 per pound</td>
<td>250</td>
</tr>
<tr>
<td>NH&lt;sub&gt;3&lt;/sub&gt;-N</td>
<td>$0.2380 per pound</td>
<td>25</td>
</tr>
<tr>
<td>PO&lt;sub&gt;4&lt;/sub&gt;</td>
<td>$0.5950 per pound</td>
<td>11</td>
</tr>
</tbody>
</table>

Using the USEPA suggested design values<sup>1</sup> and the above surcharges, the cost to treat 1,000 gallons of septage is calculated in Table 3.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ppm</th>
<th>X</th>
<th>Mgal</th>
<th>#/gal</th>
<th>$/#</th>
<th>=</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD&lt;sub&gt;5&lt;/sub&gt;</td>
<td>7,000</td>
<td>0.001</td>
<td>8.34</td>
<td>0.1820</td>
<td>10.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSS</td>
<td>15,000</td>
<td>0.001</td>
<td>8.34</td>
<td>0.3199</td>
<td>40.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NH&lt;sub&gt;3&lt;/sub&gt;-N</td>
<td>150</td>
<td>0.001</td>
<td>8.34</td>
<td>0.2380</td>
<td>00.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO&lt;sub&gt;4&lt;/sub&gt;</td>
<td>250</td>
<td>0.001</td>
<td>8.34</td>
<td>0.5950</td>
<td>01.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>52.19</td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup>USEPA suggested design values
That is in excess of $52 per thousand gallons of septage or about 5.2 cents per gallon. Most times when you do this type of analysis of costs at a wastewater treatment facility that accepts septage you will find the cost in the range of 5 to 7 cents per gallon. But seldom is that what the facility is charging the haulers! I cannot image the rate payers being happy with their subsidizing septage treatment.

When the haulers stop being subsidized and when the haulers start to realize and accept the fact that it costs to treat these wastes properly then you will see private industry ‘step up to the plate’ and work to solve these environmental problems.

Merchant facilities provide benefits for all. Pretreating these wastes prior to introduction into the municipal wastewater treatment facility 1) simplifies operations at these facilities, 2) minimizes their environmental and regulatory concerns that a ‘hot’ load will upset their system, 3) probably gives them financial rewards by not subsidizing trucked in loads, and 4) minimizes their issues with truck traffic and odors. And, maybe best of all, management no longer has to deal with invoicing, collecting from, and generally dealing with hauler issues. Haulers benefit by having a facility that accepts a wider range of wastes than do most municipal wastewater treatment facilities. Merchant facilities are service based operations that must satisfy their customers needs with regard to longer acceptance hours, shorter turnaround times, guaranteed capacity (don’t tell them it is raining today and they cannot dump!). And for the driver’s convenience most facilities have restrooms, soda and snack machines, and a driver’s lounge. And, maybe best of all from the hauler’s viewpoint, a merchant facility is a place where the haulers are welcomed.

REFERENCES