

Grease Venture Outline

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The original concept for grease treatment/electricity cogeneration was to incorporate everything into one receiving site at which grease trap pumping's would be received and processed into, water, clean grease fuel and dry solid waste. For a number of reasons, this may not be feasible for an initial project at Northeast Environmental in Lawrence. A viable alternative may be to reduce the grease trap pumping's to a concentrated slurry consisting of about a third grease, a third water, and a third solids which would be shipped to a new smaller facility to produce grease fuel subsequently used for electric power generation at the new site.

Concept....Build a new facility, at a location to be determined, capable of processing approximately 1,600,000 gallons per year of grease slurry concentrate (GSC or Concentrate). This is about 4 times the volume currently being produced by NE Environmental and was chosen because it is about the same electrical capacity as the earlier facility. This is just a placeholder – This type of facility can be readily scaled up or down.

The process technology

Overall....The process at the new facility would consist of receiving tank for GSC to smooth the process flow. From the receiving tank, GSC would flow to a process separation tank via a heating section that would heat the GSC to a point sufficient to break emulsions (probably 205-210 F). Flow to and from the separation tank would be controlled to allow for a near complete separation of the GSC into clean grease, water, and solids with these products being drawn off in a continuous process. Solids would be removed via a screw auger. Water would be removed by a weir and clean grease would be removed by extraction to maintain a floating grease level. Note that this continuous process has not yet been demonstrated and will require a pilot test before committing to a full scale project.

The solid waste from the process should be clean enough for ordinary landfill. The water should require little, if any, treatment prior to discharge. If this turns out not to be true, the facility would either need additional treatment equipment or the water could be returned to the facility providing the GSC for disposal.

The clean grease fuel (GF) will need to be filtered or centrifuged to the point of having particulates less than 10 microns, at which point it can be stored in a GF tank ready for use in an engine generator or to directly provide process heat. Note that we have not demonstrated a continuous filtration (or centrifuge) method to achieve this level of cleanliness and we will need a pilot test.

Process heating....Normally, process heat would be supplied by 15 psi steam produced by diesel engine exhaust heat via a heat recovery boiler. Engine exhaust would be diverted

more or less through the heat recovery boiler or passed directly to the stack to maintain proper boiler pressure. As a backup, GF could be used in an auxiliary boiler to provide process steam as well. Note that a GF fueled burner has not yet been demonstrated and will require pilot testing.

Odor control....Initial heating of grease slurry concentrate will produce an abundance of odor that needs to be dealt with. A good candidate for controlling these odors is to enclose the process tanks and keeping a slight negative pressure on the enclosure via fan discharge through a wet scrubber using an oxidizing scrubbing medium – such as a weak bleach solution. This odor control system needs a pilot scale trial as well.

Testing

Pilot tests....The technology for producing grease fuel has been done in pieces using a batch process. For a commercial scale operation, a continuous process is needed. Much of this could be done at the Northeast Environmental facility in Lawrence on a scale that would not significantly impact its other operations – probably on the order of 50 gallons of clean grease fuel per day. The testing sequence envisioned is as follows.

Odor Control....The small scale wet scrubber tower built for testing at the Lawrence facility should be tested before any other process work attempted. The best means would be to heat grease in the existing test rig passing the exhaust gas from the area (use a temporary enclosure made of poly sheeting) through the scrubber to verify that it can kill the odor.

Heat Grease Slurry Concentrate....Initially use natural gas or diesel fuel to produce 15 psi steam and use this steam to heat GSC to 205-210 F. There are commercial steam heaters that use high pressure steam. We need to adapt one of these to our purposes and then prove that it works. Attached are two images of possible direct steam heaters.

Separation tank....Once odor can be controlled and the grease slurry effectively heated, the separation tank will need to be tested. This is the key process element and will probably need to be modified a few times before we can optimize its operation. A converted 250 gallon fuel oil tank could probably serve as the basis for this test tank. It would need to be modified to provide the baffles and weirs needed for the water and grease fuel off-takes. It would also need a hopper type bottom installed but, for the initial tests, the solids could be periodically removed manually. In the longer term we could use something like a Flexcon screw auger system to remove the solids. We need to come to a consensus on this test tank design before we go much further in this project. Attached is a rough sketch of what I believe would be a workable separation tank design.

Fuel filtration....The grease fuel extracted from the tank should be free of water and large particles but will require further filtration before it can be used as an engine fuel. A 10 micron filter would always work but a high level of “fines” in the grease would lead to rapid

clogging and would be expensive. In this case, a vertical centrifuge may be needed as well. This can only be determined with a pilot scale test of the grease fuel coming from the separation tank.

Grease fuel fired burner In the final design, process heat will be normally provided by exhaust and jacket water heat recovery from the engine generators. However, a grease fuel fired burner could be a valuable backup process heat source. The engine exhaust heat recovery scheme would route engine exhaust through a “fire tube” type heat recovery boiler. It should be relatively straightforward to adapt a heavy oil burner to burn grease fuel and pass the combustion products from this burner (with some dilution air) through the same heat recovery boiler. This could be done in parallel with some of the other testing.