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ORRCO Air Emissions Proposal September 3, 2016

Over the last several months ORRCO has done considerable air emissions monitoring and testing, as well as reviewing of our operations and processes. We have collected useful data and learned several things from both the testing required by EPA's section 114 letter and our ongoing research. Based on this information, ORRCO is proposing improvements and changes to reduce emissions and potentially to reduce nuisance odors, as well as update our air permit renewal application based on the present and future operation of ORRCO.

ORRCO has several processes and products. The processes that do not generate air contaminants and potential odors are not addressed here. Based on the IR video testing, the FID leak testing, the odor monitoring, the Matheson tube testing, and the calculations in our air permit, the largest sources of VOCs and potential odors are the bubble condenser and scrubber. Smaller sources include: uncontrolled tank vents on the fuel and raw process water tanks, and the hot oil from the automatic filter-cleaning cycle. We have already changed the automatic filter so it filters cold oil going to the cooker instead of hot oil leaving the cooker, thereby eliminating that source.

ORRCO has hired PESCO, an engineering company specializing in air emissions and used-oil processes. We spent two days designing and planning several improvements to our processes. ORRCO believes and PESCO agrees that a used oil re-refining process can operate with very little off-site odors. PESCO has assisted us with the thermal oxidizer loading, the continuous flow cooker modifications, and the VOC bypass scrubber/carbon system. All based on other comparable facilities operating in the United States.

ORRCO would like to make several changes to our process. Some of these will be added to a revised permit application and submitted separately. The others are included in the attached Notice of Intent to Construct (NOIC). We would like to start implementing these changes immediately upon approval. The specific changes are described below:

NOIC changes:

1. Replace the bubble condenser with heat exchangers on the three existing cookers: #9, #10, and #11. Channel the vents from the cookers to a thermal oxidizer.
2. Change the three cookers from batch to continuous flow.
3. Modify our existing heater to also be a thermal oxidizer.
4. Install a control system for all cookers with a bypass scrubber and carbon barrels to shut down the feed, switch to the scrubber, and sound an alarm if the thermal oxidizer is not operating within normal parameters.
5. Add a sour water stripper for the process water to recover the fuel and strip the odor from the water. The vent from this would also flow to the thermal oxidizer.
6. Install a single column rocket for testing and data acquisition for our permit renewal.
7. Startup our standby boiler and shut down our existing Kewanee boiler (no emission change).

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Replace Bubble Condenser:

The existing bubble condenser is by far the largest source of VOCs in our permit. The vapors from cooker tanks #9, #10 and #11 are condensed in the bubble tank. We propose replacing it with three separate shell and tube condensers, one on each cooker. These condensers would each have a separate receiver to collect the light distillates and water. The vent from these receivers will go to the burner/thermal oxidizer creating a closed system, substantially reducing our VOC emissions.

Change the three cookers from batch to continuous flow:

The three cookers are currently batch processes. We fill the cook tank, heat it (250 degrees F. typically), then transfer the cooked oil to a storage tank. There are many benefits to a continuous flow cooker: it is much more efficient, the heat of the finished oil exiting the cooker preheats the oil feeding into the cooker. Continuous flow also allows the heater/thermal oxidizer to run continuously to destroy the VOCs. The feed rate can vary depending on the production needs. There are additional controls and safeguards as well.

Modify our existing heater to also be a thermal oxidizer:

A Thermal Oxidizer (TOX) with >1400 degrees F temperature and a one second residence time will destroy the VOCs. The same heater used for the oil process can be modified to have a one second residence time, >1400 degrees F temperature, and the proper turbulence to assure 99%+ destruction. Using the same heater as the TOX is much more efficient and recovers the energy from the VOCs. A stand-alone TOX would burn several gallons per hour of fuel with no recovery of the heat.

Install a control system:

ORRCO will install a PLC control system for all the burning devices, VOC devices, and TOX. ORRCO will install a scrubbing system consisting of a wet scrubber and two carbon barrels. If the TOX fails, the control system will automatically stop the feed to all cookers, sound an alarm, and switch the flow to the scrubber system.

Add a sour water stripper:

The process water from a high temperature distillation process contains emulsified fuel components and mercaptans creating an odorous water. PESCO recommends a sour water stripper (see attached drawing). We did some lab testing and the water was substantially improved as well as the fuel was recovered. The recovered fuel components would be blended into the plant fuel and the stripped water would go to water treatment.

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Install a single column rocket:

ORRCO has a single column oil polishing system (Rocket) and we would like to install it for testing and data acquisition. This would allow a more accurate calculation for our permit renewal as well as providing real data. The small amount of emissions would go to the TOX. This is a test unit and not a production system.

Some background on the Rocket oil polish system: The Rocket is a system using activated bauxite to polish the re-refined base oil to make it into a group two base oil without hydro-treating. It is not a filter, it is an absorption system. There is a small amount of heat generated during the absorption process indicating that a chemical reaction is occurring rather than filtration. After absorption, the bauxite is re-activated by a controlled combustion of the remaining oil. The oil burn rate is controlled by the incoming airflow to keep the temperature constant. All the combustion gasses coming out of the vacuum blower go to the thermal oxidizer. This is a common device used in many oil processing plants as an option to using hydro-treating.

We look forward to working with you, completing these improvements, and finalizing our air permit renewal. Please let me know if you have any questions and require additional information. We believe these changes will address any odor concerns and represent the best practices available.

Respectfully submitted,

Scott Briggs

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