



Supplemental Technical Comments  
of the Central Ohio Group of the Sierra Club Ohio Chapter  
to the Ohio Environmental Protection Agency,  
Central District Office &  
U.S. Environmental Protection Agency - Region V  
Concerning a Proposed Air Permit to Install (PTI)  
for the UPT Tire Disposal Facility, Columbus, OH

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## **1 Introduction**

The Central Ohio Group of the Sierra Club Ohio Chapter represents its members in Columbus and surrounding areas concerned about environmental protection and conservation of natural resources. In particular, the group has been concerned with the proposal by UPT for a tire disposal facility to be constructed at the site of the former City of Columbus municipal waste incinerator.

The comments below are supplementary technical comments submitted for the record on the proposal to issue an Ohio EPA air permit to install to UPT for this proposed tire disposal facility. These technical comments are supplementary in nature and are designed to support the Central Ohio Group's policy statements concerning this proposed permit that have already been introduced in the comment proceedings at public hearings and other opportunities for public comment in the pending process.

The Central Ohio Group also thanks Ohio EPA for its generous extension of the comment period deadline, which allowed these more detailed technical comments to be filed by the Group.

## **2 The Proposed UPT Facility is a Chemical Manufacturing Facility with Significant Consequences for the Permitting and Regulation of this Facility**

By virtue of thermal processing, catalytic treatment, a fundamental distillation processes for phase separations into condensable and noncondensable fractions and organic liquid/water separation, the proposed UPT tire pyrolysis facility is unmistakably a chemical manufacturing facility. It operates dryers, chemical reactors, gas and liquid treatment systems in a similar manner to what is traditionally thought of as a chemical manufacturing facility.

Similarly, chemicals expected to be produced and managed in the UPT chemical manufacturing facility include benzene, ethylbenzene, toluene, xylene, styrene, phenols, naphthalene, PAH compounds, tars, butane, ethylene, propylene, pentane, hexane, butylene, phthalate esters, limonene and other C2 to C12 materials.

### **2.1 As a Chemical Manufacturing Facility, the Proposed UPT Facility is Subject to the 100 Ton Major Stationary Source Threshold Requirement**

As a chemical manufacturing facility, the proposed UPT plant is a "chemical process" plant meeting the source category listing for the 100 ton major stationary source threshold under both OAC 3745-31-01(WW)(xxi) and within the meaning of federal

EPA requirements for state PSD permitting programs under approvable implementation plans meeting requirements at 40 CFR Sec. 51.166(b)(1)(i)(a).

Just as ethanol production plants that distill ethanol from grain fermentation are widely recognized as chemical plants subject to the 100 ton major stationary threshold requirement,<sup>1</sup> the UPT plant must similarly be considered as a chemical plant subject to the 100 ton threshold requirement as stated above. An ethanol plant involves the processing of raw materials, chemical and thermal conversion processes performed on such raw materials, gas liquid separations and post-conversion processing of the derived internal products. Each of these chemical operations in an ethanol plant has an analog and comparable process in the UPT facility. Commentors can see no distinction between an ethanol plant process and the UPT plant process that would create a distinction having the effect of disallowing the “chemical plant” description of the UPT tire pyrolysis and recovered product processes.

In addition, the UPT plant is a “carbon black plant (furnace process)” meeting the 100 ton major stationary source threshold requirement under both OAC 3745-31-01(WW)(xvi) and 40 CFR Sec. 51.166(b)(1)(i)(a) since the UPT facility utilizes both a raw material processing furnace (the Titan reactor) and a finish processing furnace (the activation furnaces) that meets the cited definition in both applicable Ohio EPA and U.S. EPA rules.

As a result, Ohio EPA’s determination that UPT is subject to the 250 ton per year major stationary source threshold must be considered to be in error and must be reversed and re-evaluated in favor of a determination that the 100 ton threshold applies.

## **2.2 Ohio EPA and UPT Must Determine Whether the UPT Facility will be Subject to Federal Requirements for Benzene Waste NESHAPS**

Under 40 CFR Part 61, Subpart FF, Sec. 61.341:

“Chemical manufacturing plant means any facility engaged in the production of chemicals by chemical, thermal, physical or biological processes for use as a product, co-product, by-product, or intermediate including but not limited to industrial organic chemicals, organic pesticide products, pharmaceutical

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<sup>1</sup> The reader can review any of the enforcement documents at <http://www.epa.gov/Compliance/civil/programs/caa/ethanol/index.html> to note that EPA has been enforcing the 100 ton major stationary threshold requirement concerning ethanol plants as a result of their consideration of them as “chemical process” plants subject to the PSD 100 ton major stationary source PSD threshold.

preparations, paint and allied products, fertilizers, and agricultural chemicals. Examples of chemical manufacturing plants include facilities at which process units are operated to produce one or more of the following chemicals: benzene sulfonic acid, benzene, chlorobenzene, cumene, cyclohexane, ethylene, ethylbenzene, hydroquinone, linear alkylbenzene, nitrobenzene, resorcinol, sulfolane or styrene.”

Under this definition, the UPT facility is clearly a “chemical manufacturing facility” potentially subject to the subpart FF benzene waste NESHAPS regulation. As a result, an affirmative determination must be made during the permitting process whether the production of nearly 3300 pounds per hour of pyrolysis oil from tires containing benzene and other chemical compounds will trigger further requirements of the Subpart FF rules, notably for tanks, vent systems and oil-water separators.

### **3 Emission Events Related to Process Upsets and Pressure Operated Relief Valves**

The UPT application contains a flow sheet in the A-10 emission source section. The flow sheet and the applicant’s list of equipment capable of fugitive emissions shows pressure operated relief valves at the Titan reactor, the coalescing filter, condenser #1 and #2, the oil transfer tank and the gas surge tank.

The application shows no details on the exit points and the disposition of relief gases that would occur from any openings of such pressure operated relief valves.

Operation of a pyrolysis reactor and associated equipment has the potential to lead to overpressure events from flow obstruction of process piping, flame arrestors and equipment from buildup of tarry solids and tramp fibers. Deposition of these same materials in the internals of pressure operated relief valves can lead to leaky valve conditions. Finally, chance oxygen intrusion into pyrolysis systems caused by failures in pressure lock feeder and discharge equipment can lead to exothermic combustion reactions with gaseous system components and subsequent overpressure situations.

Events associated with releases from pressure operated relief valves have a high potential to release strong odors of reduced sulfur compounds and pyrolyzed hydrocarbon products and pyrolysis oil aerosols. Given the hazards such material releases would pose to workers in the facility it is likely that emission products from pressure operated relief valve openings would be conveyed to outdoor vents with a high likelihood for strong odor impacts in the community because of the presence of hydrogen sulfide, methyl mercaptan, carbonyl sulfide and a multitude of petroleum hydrocarbons.

The UPT application should not be approved until and unless more details are disclosed about the entire matter of handling of pressure operated valve venting emissions. All such emissions from such pressure operated valves should be conveyed to a manifold system with combustion of such relief gases in either the thermal oxidizer or a dedicated VOC fume incinerator. All pressure operated relief valves should be instrumented and alarmed to the operator as to valve releases. In the event that a manifold system is not used, rupture disks should be incorporated as a protection against leaking pressure operated valves, particularly if a system of leak detection and repair cannot determine valve leakage status because of vent inaccessibility.

The applicant should be placed under a burden of showing how pressure operated relief valves, flame arrestors and filters will be cleaned and maintained to avoid flow obstruction events. Any feature of the plant that allows release of either pre- or post-filter synthesis gas or producer gas to be released to an atmospheric vent during times other than overpressure events should be revealed and the application should not be approved until and unless such atmospheric venting would be directed to a control device.

**4 The Sulfur Dioxide Emission Characterization Does Not Account for Worst Case Conditions Admitted by Applicant at their Korean Unit and for all Total Reduced Sulfur Compounds likely to be found in Synthesis Gas**

In this section Commentors raise criticisms of the method by which the sulfur dioxide emission characterization was made of the proposed facility. The criticisms raise the significant potential that sulfur dioxide emissions under facility operation will be larger than predicted raising the potential that the facility will not be able to comply with its federally enforceable minor source emission limitations.

UPT's pre-scrubber sulfur dioxide emission estimate of 0.14 lb/MMBtu for the combustion of synthesis gas is based on an assumption of 60 ppm<sub>dv</sub> at 7 % O<sub>2</sub> when the applicant admits that tests at their Korean unit showed an average of 323 ppm of sulfur dioxide. This discrepancy is dismissed with the statement:

“The technology consultant reports that with improved design most sulfur in the raw material should tie-up with the carbon and predicts that emission results should be more in line with the Taiwan test [indicated as 14 ppm, sulfur dioxide.]”<sup>2</sup>

Applicant's submittal does nothing to explain the basis for such statements concerning “improved design” that will cause “most sulfur” to “tie-up with the carbon” in the pyrolyzed materials. The hydrogen sulfide content of synthesis gas will be heavily dependant on hydrogenation of sulfur-bearing compounds and the subsequent stripping of

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<sup>2</sup> Section 4(I) of application, “Basis for Synthesis Gas Heat Value and Exhaust Flows”

such sulfur into the bulk of the synthesis gas. The presence of hydrogen for this purpose will be heavily dependent on temperature and pressure conditions in the reactor as well as being the limiting factor on the evolution of hydrogen from stripping of sulfur from other hydrocarbons present. Applicant's synthesis gas model shows hydrogen at 6.9 mole % in uncombusted gas when other sources show significantly higher hydrogen in two gas analysis specifications of 19.87 mole percent and 14.24 mole percent.<sup>3</sup>

Until a convincing technical argument is made to the contrary, Applicant's admission of sulfur dioxide emissions from synthesis gas combustion of 323 ppm at their Korean unit should be used as a worst case emission estimation.

Throughout its submittal, Applicant has projected sulfur dioxide emissions from the combustion of synthesis gas based only on its assumption of a maximum hydrogen sulfide content of that gas at 0.10 mole percent. Applicant's analysis failed to consider the presence of other reduced sulfur compounds that are virtually certain to be present that would increase emission estimates for sulfur dioxide from combusted gas.

In addition to hydrogen sulfide, uncombusted synthesis gas is likely to include methyl mercaptan (boiling point 5.8 degrees C), dimethyl sulfide (boiling point 37.3 degrees C) and carbonyl sulfide (boiling point -50.2 degrees C). All of these reduced sulfur compounds would contribute to sulfur dioxide emissions once they reach a combustion device. Because of their boiling points they would likely remain as "non-condensable" gases that are present in synthesis gas..

## **5 Issues of Carbon Monoxide Emissions**

### **5.1 Applicant's Statements Concerning the Quality Goals for Carbon Activation and the Consumption of Carbon Mass in Such a Process Cannot be Reconciled with the Applicant/Ohio EPA Carbon Monoxide Emission Calculations from the Carbon Activation Furnace**

Applicant's reactor vendor, Titan Technologies Inc., has published a "frequently asked questions" indicating that loss of carbon black in the activation furnace process for transformation to activated carbon is "expected to be in the range of 30-50%."<sup>4</sup> However, applicant's PTI submittal discusses data showing carbon black input to the

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<sup>3</sup> Appendix Tables D-6 and D-3, Final Report Environmental Factors of Waste Tire Pyrolysis, Gasification and Liquefaction, CalRecovery Inc, July 1995

<sup>4</sup> FAQ at Titan's website as of October 8, 2003 at <http://www.titantechnologiesinc.com/faq.html>

activation furnaces of 2500 lb/hour with activated carbon outputs of 2083 lb/hour. This is equivalent to about a 17% rate of carbon black input loss in the activation furnace.

Operating the furnace at temperatures and material throughput residence times so that activation losses increase to as much as 30-50% in this oxygen-starved furnace will mean significant additional amounts of both carbon monoxide and methane in the producer/activation gases fed to the thermal oxidizer. At Applicant's 17% rate of carbon black loss, the producer gas contributes 616 lbs/hour or 2439 tons/year<sup>5</sup> as an uncontrolled emission rate input to the thermal oxidizer. If the carbon loss rate in this furnace was doubled or tripled, a commensurate increase in carbon monoxide emissions would be noted with the potential to exceed the 100 tons per year major stationary source threshold.

In summary, the Applicant has admitted that a 30-50% carbon loss rate might be necessary to achieve the necessary product specifications for their activated carbon customers. However, all of Applicant's emission calculations were based on a 17% carbon loss rate. As a result, Applicant's emission characterization for carbon monoxide is not a conservative analysis. Applicant is unlikely to be able to comply with its permitted carbon monoxide emission limitations. Air permitting that does not limit the carbon loss rate in the process with enforceable physical conditions limiting this potential to emit for carbon monoxide should be accompanied by carbon monoxide continuous emission monitoring and correspondence carbon monoxide gas concentration emission limitations on this source to ensure permit compliance at all times.

## **5.2 Applicant's Carbon Monoxide Emission Factor Estimates from the Activation Furnace Raise Questions on Whether the Facility can Comply with its Carbon Monoxide Emission Limitations**

Applicant and Ohio EPA appear to be using an emission factor of 0.14 lb per million BTU in an attempt to characterize the controlled carbon monoxide emissions from combustion of producer gas from each of the carbon activation furnaces at 0.63 lb per hour. Commentors assert that this emission characterization is highly speculative and that the facility is unlikely to be able to comply with this limitation.

As noted in the prior section, the applicant admits a combined 616 lbs/hour of carbon monoxide emissions from the two activation furnaces as an uncontrolled emission rate. In order to reach 1.26 lbs/hour of controlled carbon monoxide emissions as provided for the emission limitations for B003 and B004 combined, the thermal oxidizer would have to achieve a carbon monoxide control efficiency of 99.8%. And such a control

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<sup>5</sup> May 8, 2003 electronic mail and attached files from Bob Chalfant, Lockwood Green to Richard Lindstrom, OEPA-CDO-Permits



efficiency would only be calculated on inlet carbon monoxide without considering the fact of carbon monoxide produced from combustion of the high inlet methane stream as well as carbon monoxide produced by combustion of synthesis gas in the thermal oxidizer burner.

In a thermal oxidizer using staged combustion and/or low NOX burners a 99.8% control efficiency in this circumstance is completely unrealistic, especially when the vendor only guaranteed 98% on organic carbon. A more realistic control efficiency would be of the order of 90-95% control for inlet carbon monoxide by the time all other factors are considered. Applicant's letter from their thermal oxidizer vendor does not provide any guarantee at all on carbon monoxide control efficiency, let alone 99.8%.

In conclusion, the Applicant's carbon monoxide emission calculations are not conservative and are unlikely to adequately characterize carbon monoxide emissions from the facility in practice. Applicant is unlikely to be able to comply with the carbon monoxide emissions of the permit as issued without "cherrypicking" the operating conditions of the plant during the required stack test. Once unmonitored usual and ordinary operations began, the failure to require continuous emission monitoring for carbon monoxide will allow the Applicant to evade accountability for compliance with carbon monoxide emission limitations. All such problems of compliance will be exacerbated if the Applicant must take actions to increase activation furnaces losses of carbon in order to optimize their product for sale to their customers.

## **6 Additional Concerns from Process Review**

### **6.1 Applicant's Low Temperature Pyrolyzing Process Raises Certain Fugitive Emission and Product Handling Issues**

The Applicant admits that the hydrogen content of its carbon black intermediate product might be as high as 5.08% based on a similar process. This hydrogen would not exist as free molecular hydrogen but as bound hydrocarbon compounds in the matrix of the carbon black. Applicant is pursuing a low temperature (450 degrees F) pyrolysis process apparently to optimize oil production and limit conversion to carbon monoxide in synthesis gas. Such a low temperature process, which has not been used on most other attempts at pyrolysis plants, may very well have the potential to permit incomplete or inadequate "bake out" of longer chain, higher boiling point hydrocarbon compounds from the carbon black matrix produced in the pyrolysis process. This means that uncontrolled organic carbon and carbon monoxide emissions at the activation furnaces may be further understated than they already are when material with inadequate "bake out" characteristics are processed in downstream furnaces. Such a phenomena may also increase VOC emissions from the pelletizer dryer which has no VOC emission control through its baghouse control and disposition out vent A-16 and through the pellet receiver at vent A-14..

There can be no assurance that fugitive emissions will remain as low as those indicated in Applicant's submittal without a permit requirement grounded in Ohio Best Available Technology provisions for at least a minimal leak detection and repair (LDAR) program. Such an LDAR program would also be necessary to prevent process leaks at the facility from causing and/or contributing to odor impacts from hydrogen sulfide, methyl mercaptan, carbonyl sulfide and a multitude of petroleum hydrocarbons that will be found in uncontrolled or poorly controlled process equipment leaks.

## **6.2 Applicant's Characterization of Fugitive Emissions is Incomplete**

The Applicant's characterization of plant-wide fugitive emissions under A-10 is incomplete. No emission characterization for odorous reduced sulfur compounds is provided. In addition, there is no fugitive emission characterization for the "lock hopper" reactor charging device and process screw auger conveyor end shaft seals which will operate in what is presumed to be a greater than atmospheric pressurized reactor. The application contains very little detail about the method for discharging both carbon black and metals from the reactor. Both input and output reactor devices have the potential from fugitive emissions of VOCs, carbon monoxide, odors, hydrogen sulfide, cyanide gas, etc. but this issue has not been discussed and the emissions have not been characterized.

## **6.3 Shut Down Flow Out Synthesis Gas Considerations**

The proposed permit should be amended to require the facility to maintain at least one stable synthesis gas incineration point capable of handling any residual synthesis gas generation as the facility "flows out" during shutdown. The permit should not allow release of uncombusted synthesis gas during shutdown scenarios.

## **6.4 The Proposed Process May Pose Certain Cross Media Transfer Problems for Toxicants to Aqueous Media**

Review of the process indicates that contact process wastewater will be discharged to sewers from the scrubber, from metal washing operations and from the oil water separator. These process sources have the potential to contaminate such wastewater with toxic metals, polycyclic aromatic hydrocarbons and certain other hydrocarbon compounds. There does not appear to be a plan for pre-treatment of any of this wastewater before discharge to public sewers. This issue must be clarified with City of Columbus wastewater authorities and pre-treatment requirement enforcement staff.

**7 Errors in Permit**

Condition EU B002, Part II.B.2 & 3 have errors. Condition 2 has an erroneous reference to pH and Condition 3 omits the reference to pH. Both are on page 15 of 66

Condition EU B004, Part II.A.1 erroneously refers to this as carbon activation unit No. 1 when B004 is for Unit No. 2 See Page 35 of 66

All of the emission calculations in Applicant's submittal depend on a 330 day year for emission calculations. However, nothing in the permit is a federally enforceable condition limiting the amount of plant operation to 330 days per year. If the Applicant is not bound by a federally enforceable permit provision limiting the number of days of operation per year to 330, then Oh EPA should then reject the emission calculations of the permit application and insist on PTE calculations based on a full 365 day year.