MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

MISSOURI AIR CONSERVATION COMMISSION

PERMIT TO CONSTRUCT

Under the authority of RSMo 643 and the Federal Clean Air Act the applicant is authorized to construct the air contaminant source(s) described below, in accordance with the laws, rules and conditions as set forth herein.

Permit Number: 042017-014 Project Number: 2016-11-054

Installation Number: 147-0043

Parent Company: Maryville Tire Solutions, LLC

Parent Company Address: 1035 Pearl St, Ste 420, Boulder, CO 80302

Installation Name: Maryville Carbon Solutions, LLC

Installation Address: 600 Wilson Industrial Blvd, Maryville, MO 64468

Location Information: Nodaway County, S16, T64N, R35W

Application for Authority to Construct was made for:
Modification of a tire pyrolysis installation. This review was conducted in accordance with Section (5), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required.*

☐ Standard Conditions (on reverse) are applicable to this permit.

☑ Standard Conditions (on reverse) and Special Conditions are applicable to this permit.

Prepared by
David Little, PE
Environmental Engineer III
New Source Review Unit

Director or Designee
Department of Natural Resources

APR 28 2017

Effective Date

STANDARD CONDITIONS:

Permission to construct may be revoked if you fail to begin construction or modification within two years from the effective date of this permit. Permittee should notify the Enforcement and Compliance Section of the Air Pollution Control Program if construction or modification is not started within two years after the effective date of this permit, or if construction or modification is suspended for one year or more.

You will be in violation of 10 CSR 10-6.060 if you fail to adhere to the specifications and conditions listed in your application, this permit and the project review. In the event that there is a discrepancy between the permit application and this permit, the conditions of this permit shall take precedence. Specifically, all air contaminant control devices shall be operated and maintained as specified in the application, associated plans and specifications.

You must notify the Enforcement and Compliance Section of the Department's Air Pollution Control Program of the anticipated date of start up of this (these) air contaminant source(s). The information must be made available within 30 days of actual startup. Also, you must notify the Department's regional office responsible for the area within which you are located within 15 days after the actual start up of this (these) air contaminant source(s).

A copy of the permit application and this permit and permit review shall be kept at the installation address and shall be made available to Department's personnel upon request.

You may appeal this permit or any of the listed special conditions to the Administrative Hearing Commission (AHC), P.O. Box 1557, Jefferson City, MO 65102, as provided in RSMo 643.075.6 and 621.250.3. If you choose to appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed. If it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

If you choose not to appeal, this certificate, the project review and your application and associated correspondence constitutes your permit to construct. The permit allows you to construct and operate your air contaminant source(s), but in no way relieves you of your obligation to comply with all applicable provisions of the Missouri Air Conservation Law, regulations of the Missouri Department of Natural Resources and other applicable federal, state and local laws and ordinances.

The Air Pollution Control Program invites your questions regarding this air pollution permit. Please contact the Construction Permit Unit using the contact information below.

<u>Contact Information</u>:
Missouri Department of Natural Resources
Air Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102-0176
(573) 751-4817

The regional office information can be found at the following website:
http://dnr.mo.gov/regions/

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SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

The special conditions listed in this permit were included based on the authority granted the Missouri Air Pollution Control Program by the Missouri Air Conservation Law (specifically 643.075) and by the Missouri Rules listed in Title 10, Division 10 of the Code of State Regulations (specifically 10 CSR 10-6.060). For specific details regarding conditions, see 10 CSR 10-6.060 paragraph (12)(A)10. "Conditions required by permitting authority."

Maryville Carbon Solutions, LLC
Nodaway County, S16, T64N, R35W

1. Superseding Condition
   The conditions of this permit supersede all special conditions in the previously issued construction permits 042009-010 and 042009-010A.

2. SO_2 Emission Limitation
   A. Maryville Carbon Solutions, LLC shall emit less than 40.0 tons of SO_2 in any consecutive 12-month period from the entire installation (see Table 1).

   B. Maryville Carbon Solutions, LLC shall develop and use forms to demonstrate compliance with Special Condition 2.A. The forms shall contain at a minimum the following information,
      1) Installation name
      2) Installation ID
      3) Permit number
      4) Current month
      5) Current 12-month date range
      6) Monthly throughput for each emission unit with the potential to emit SO_2
      7) SO_2 emission factors for each emission unit
         a) At the time of this permit's issuance the emission factors are in Table 1

Table 1: Initial SO_2 Emission Factors

Emission Unit	Description	Emission Factor
EP 12	pyrolysis heater	1638.363 lb / MMCF gas input
EP 6	flare	1638.363 lb / MMCF gas input
EP 4	[redacted] combustion, and any other natural gas usage such as space heaters or natural gas usage at EP 12 or EP 6	0.6 lb / MMCF gas input
EP 11	emergency diesel genset	2.12E-04 lb / gal input

Syngas for EP 12 and EP 6 may be combined as there is one common syngas flow meter.

         b) When Maryville Carbon Solutions, LLC tests the sulfur content of syngas used to fuel the pyrolysis heater and flare

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SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

in accordance with Special Condition 17, Maryville Carbon Solutions, LLC shall develop new (lb/ MMCF) SO_2 emission factors to demonstrate compliance with Special Condition 2.A. The following equation shall be used,

Emission factor (lb SO_2 / MMCF syngas input)
= Tested sulfur weight %
x 64.07 molecular weight SO_2 / 32.07 molecular weight S
x 0.082 lb syngas per cubic foot syngas
x 1,000,000 CF per 1 MMCF

8) Monthly emissions for each emission unit calculated using the following equation:

$$SO2\ emissions\ (tons) = Throughput \times Emission\ unit\ specific\ emission\ factor \left(\frac{lb\ SO2}{throughput}\right) \times \left(\frac{1\ ton\ SO2}{2000\ lbs\ SO2}\right)$$

9) Monthly emissions of SO_2 calculated by summing SO_2 emissions from each emission unit
10) 12-month rolling total SO_2 emissions from all emission units, and the sum of all SO_2 emissions from startup, shutdown, and malfunction as reported the Air Pollution Control Program's Compliance/Enforcement Section in accordance with 10 CSR 10-6.050
11) Indication of compliance status with Special Condition 2.A.

3. Methylnaphthalene (2-) Emission Limitation
   A. Maryville Carbon Solutions, LLC shall emit no more than 0.01 tons of methylnaphthalene (2-) CAS 91-57-6 in any consecutive 12-month period from the entire installation (see Table 2).

   B. Maryville Carbon Solutions, LLC shall develop and use forms to demonstrate compliance with Special Condition 3.A. The forms shall contain at a minimum the following information,
      1) Installation name
      2) Installation ID
      3) Permit number
      4) Current month
      5) Current 12-month date range
      6) Monthly throughput for each emission unit with the potential to emit methylnaphthalene (2-)
      7) methylnaphthalene (2-) emission factors for each emission unit

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

a) At the time of this permit's issuance the emission factors are in Table 2

Table 2: Initial methylnaphthalene (2-) Emission Factors

Emission Unit	Description	Emission Factor
EP 12	pyrolysis heater	2.40E-05 lb / MMCF gas input
EP 6	flare	2.40E-05 lb / MMCF gas input
EP 4	[redacted] combustion and any other natural gas usage such as space heaters or natural gas usage at EP 12 or EP 6	2.40E-05 lb / MMCF gas input
EP 7	tank, light synoil	4.80E-04 lb / gal throughput
EP 8	tank, heavy synoil day	1.13E-06 lb / gal throughput
EP 9	tank, heavy synoil	1.13E-06 lb / gal throughput

Syngas for EP 12 and EP 6 may be combined as there is one common syngas flow meter.

b) When Maryville Carbon Solutions, LLC tests the methylnaphthalene (2-) content of light synoil and heavy synoil in accordance with Special Condition 17, Maryville Carbon Solutions, LLC shall develop new (lb/ gal) methylnaphthalene (2-) emission factors to demonstrate compliance with Special Condition 3.A. The following equations shall be used,

Emission factor (lb methylnaphthalene (2-) / gal light synoil)
= Tested light synoil methylnaphthalene (2-) weight %
x 0.016 lb VOC per gallon light synoil

Emission factor (lb methylnaphthalene (2-) /gal heavy synoil)
= Tested heavy synoil methylnaphthalene (2-) weight %
x 1.88E-05 lb VOC per gallon heavy synoil

8) Monthly emissions for each emission unit calculated using the following equation:

$$Methylnaphthalene\ (2-) emissions\ (tons) = Throughput \times Emission\ unit\ specific\ emission\ factor \left(\frac{lb\ \text{methylnaphthalene}\ (2-)}{throughput}\right) \times \left(\frac{1\ ton\ \text{methylnaphthalene}\ (2-)}{2000\ lbs\ \text{methylnaphthalene}\ (2-)}\right)$$

9) Monthly emissions of methylnaphthalene (2-) calculated by summing methylnaphthalene (2-) emissions from each emission unit

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

10) 12-month rolling total methylnaphthalene (2-) emissions from all emission units, and the sum of all methylnaphthalene (2-) emissions from startup, shutdown, and malfunction as reported the Air Pollution Control Program's Compliance/Enforcement Section in accordance with 10 CSR 10-6.050
11) Indication of compliance status with Special Condition 3.A.

4. Anthracene Emission Limitation
A. Maryville Carbon Solutions, LLC shall emit no more than 0.01 tons of anthracene CAS 120-12-7 in any consecutive 12-month period from the entire installation (see Table 3).

B. Maryville Carbon Solutions, LLC shall develop and use forms to demonstrate compliance with Special Condition 4.A. The forms shall contain at a minimum the following information,
1) Installation name
2) Installation ID
3) Permit number
4) Current month
5) Current 12-month date range
6) Monthly throughput for each emission unit with the potential to emit anthracene
7) Anthracene emission factors for each emission unit
a) At the time of this permit's issuance the emission factors are in Table 3

Table 3: Initial Anthracene Emission Factors

Emission Unit	Description	Emission Factor
EP 12	pyrolysis heater	2.40E-06 lb / MMCF gas input
EP 6	flare	2.40E-06 lb / MMCF gas input
EP 4	[redacted] combustion and any other natural gas usage such as space heaters or natural gas usage at EP 12 or EP 6	2.40E-06 lb / MMCF gas input
EP 7	tank, light synoil	4.32E-04 lb /gal throughput
EP 8	tank, heavy synoil day	1.02E-06 lb / gal throughput
EP 9	tank, heavy synoil	1.02E-06 lb / gal throughput
EP 11	emergency diesel genset	2.52E-06 lb /gal input

Syngas for EP 12 and EP 6 may be combined as there is one common syngas flow meter.

b) When Maryville Carbon Solutions, LLC tests the anthracene content of light synoil and heavy synoil in accordance with Special Condition 17, Maryville Carbon Solutions, LLC shall develop new (lb/ gal) anthracene emission factors to

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

demonstrate compliance with Special Condition 4.A. The following equations shall be used,

Emission factor (lb anthracene / gal light synoil)
= Tested light synoil anthracene weight %
x 0.016 lb VOC per gallon light synoil

Emission factor (lb anthracene / gal heavy synoil)
= Tested heavy synoil anthracene weight %
x 1.88E-05 lb VOC per gallon heavy synoil

8) Monthly emissions for each emission unit calculated using the following equation:

$$Anthracene\ emissions\ (tons) = Throughput \times Emission\ unit\ specific\ emission\ factor \left(\frac{lb\ anthracene}{throughput}\right) \times \left(\frac{1\ ton\ anthracene)}{2000\ lbs\ anthracene}\right)$$

9) Monthly emissions of anthracene calculated by summing anthracene emissions from each emission unit
10) 12-month rolling total anthracene emissions from all emission units, and the sum of all anthracene emissions from startup, shutdown, and malfunction as reported the Air Pollution Control Program's Compliance/Enforcement Section in accordance with 10 CSR 10-6.050
11) Indication of compliance status with Special Condition 4.A.

5. $PM_{2.5}$ Emission Limitation
   A. Maryville Carbon Solutions, LLC shall emit less than 10.0 tons of $PM_{2.5}$ in any consecutive 12-month period from the entire installation (see Table 4).

   B. Maryville Carbon Solutions, LLC shall develop and use forms to demonstrate compliance with Special Condition 5.A. The forms shall contain at a minimum the following information,
      1) Installation name
      2) Installation ID
      3) Permit number
      4) Current month
      5) Current 12-month date range
      6) Monthly throughput for each emission unit with the potential to emit $PM_{2.5}$
      7) $PM_{2.5}$ composite emission factors as listed in Table 4

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

Table 4: Initial $PM_{2.5}$ Composite Emission Factors

Composite Unit	Emission Units in the Composite	Composite Emission Factor
EP 1: Tires / Shreds	Primary tire shredder	0.848 lb / ton tires or shreds received
	Primary shred tire storage	
	Secondary tire shredder	
	Secondary shred tire storage	
	Shreds into feed hopper	
	Haul road: tire receiving	
EP 5: Char	■	■ lb / ton char produced
	■	
	■	
	■	
	■	
	■	
	■	
	■	
	■	
	■	
	■	
EP 12	Pyrolysis heater	7.6 lb / MMCF gas input
EP 6	Flare	7.6 lb / MMCF gas input
EP 4	■ combustion, and any other natural gas usage such as space heaters or natural gas usage at EP 12 or EP 6	7.6 lb / MMCF gas input
EP 11	Emergency diesel genset	6.12E-03 lb / gal input
EP 13B	Haul road: diesel receiving	1.95E-05 lb / gal received

EP 12, EP6, and EP4 may be combined.

8) Monthly emissions for each composite emission unit calculated using the following equation:

$$PM2.5\ emissions\ (tons) = Throughput \times Composite\ emission\ factor\ \left(\frac{lb\ PM2.5}{throughput}\right) \times \left(\frac{1\ ton\ PM2.5}{2000\ lbs\ PM2.5}\right)$$

9) Monthly emissions of $PM_{2.5}$ calculated by summing all $PM_{2.5}$ emissions from each composite emission unit

10) 12-month rolling total $PM_{2.5}$ emissions from the emission units, and the sum of all $PM_{2.5}$ emissions from startup, shutdown, and malfunction as reported the Air Pollution Control Program's Compliance/Enforcement Section in accordance with 10 CSR 10-6.050

11) Indication of compliance status with Special Condition 5.A.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

6. Flowrate Limitation
   A. Maryville Carbon Solutions, LLC shall not exceed the air flowrates listed in Table 5.

Table 5: Air Flowrates

Control Device	Description	Flowrate (cfm)
CD 1	Tire sheds dust collector	12,000
CD 2	[redacted] dust collector	[redacted]
CD 3	[redacted] dust collector	[redacted]
CD 4	[redacted] dust collector	[redacted]

   B. Maryville Carbon Solutions, LLC shall demonstrate compliance at each control device by,
      1) At least once per calendar quarter conducting testing to determine the average velocity at each respective control device. Testing shall be conducted using a method preapproved by the Air Pollution Control Program. The respective velocity shall by multiplied by the cross sectional area to determine the flowrate., or
      2) Obtaining a copy of the manufacturer's calculations showing the theoretical flowrate, fan size, fan speed, motor amperage.
      3) Copies of the compliance method shall be maintained on site.

7. Operational Requirement – Fuel Flow Meters
   A. Maryville Carbon Solutions, LLC shall operate fuel (syngas and natural gas) flow meters. Installation-wide natural gas usage may be monitored at one common meter. Syngas usage at the flare (EP 6) and pyrolysis heater (EP 12) may be monitored at one common meter.

   B. Maryville Carbon Solutions, LLC shall continuously monitor and record the fuel flowrate into the combustion units.

   C. Maryville Carbon Solutions, LLC shall operate and maintain the meters according to manufacturer's specifications. A copy of the manufacturer's specifications shall be kept on site.

   D. Maryville Carbon Solutions, LLC shall use the respective monthly fuel throughputs in Special Conditions 2, 3, 4, 5 recordkeeping.

8. Operational Requirement – Char Washing
   A. Maryville Carbon Solutions, LLC shall not wash char with, or otherwise apply to char, any material containing [redacted].

   B. Maryville Carbon Solutions, LLC shall demonstrate compliance by keeping on site the SDS or certified product data sheet of all materials that are applied to char. The SDS or certified product data sheet shall indicate the [redacted] content. If the sole washing agent is [redacted] then no SDS is required.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

9. Emergency Engine (EP 11)
   A. Maryville Carbon Solutions, LLC shall fire the emergency engine exclusively with ultra-low sulfur diesel (ASTM D 975 Grade No. 2-D S15 Specification, or ASTM D 975 Grade No. 1-D S15 Specification) and if needed trace amounts of starting fluid. Firing with synoil or diesel-synoil mixtures is prohibited. Maryville Carbon Solutions, LLC shall keep onsite SDS of the fuel combusted, and fuel line engineering drawings/photographs showing the fuel can only be obtained from a tank containing exclusively ultra-low sulfur diesel.

   B. Maryville Carbon Solutions, LLC shall meet the requirements of 40 CFR 60 Subpart IIII, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines,* in order to classify the engine as emergency.

10. Pyrolysis Feedstock
   A. Maryville Carbon Solutions, LLC shall use as a pyrolysis feedstock exclusively shredded or similarly processed tire pieces. Whole tires are prohibited.

   B. Maryville Carbon Solutions, LLC shall demonstrate compliance by keeping records on site showing the feedstock type and size.

11. Capture Device Requirement - 100% Capture Efficiency
   A. Maryville Carbon Solutions, LLC shall monitor and record the static pressure at each emission unit listed in Table 6 at least once quarterly. The static pressure shall be negative at all times the emission units are operating.

   B. Maryville Carbon Solutions, LLC shall maintain no visible emissions exiting the emission units and ductwork in Table 6 at all times. Compliance shall be demonstrated once weekly while the emission units are operating.

   C. Maryville Carbon Solutions, LLC shall maintain sealed enclosures around all emission units and ductwork in Table 6.

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SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

Table 6: Emission Units with 100% Capture Efficiency

Emission Point	Control Device	Emission Unit Description
EP 1	CD 1 dust collector	Primary tire shredder
		Primary shred tire storage
		Secondary tire shredder
		Secondary shred tire storage
[1] EU 17	CD 6 and CD 7 condensers, CD 5 flare (EP 6), EP 12 pyrolysis heater	Pyrolysis unit
EP 5	CD 4 dust collector	Confidential char finishing emission units
EP 2	CD 2 dust collector	
EP 3	CD 3 dust collector	

[1] The pyrolysis unit is an emission unit, not an emission point.

12. Control Device Requirement – Dust Collectors

A. Maryville Carbon Solutions, LLC shall control particulate emissions from the equipment/processes indicated in Table 6 using dust collectors as specified in the permit application.

B. The dust collectors shall be operated and maintained in accordance with the manufacturer's specifications. The dust collectors shall be equipped with a gauge or meter, which indicates the pressure drop across the control device. These gauges or meters shall be located such that Department of Natural Resources' employees may easily observe them.

C. Replacement filters shall be kept on hand at all times. The filters shall be made of fibers appropriate for operating conditions expected to occur (i.e. temperature limits, acidic and alkali resistance, and abrasion resistance). The replacement filter material type and weight shall meet or exceed the specifications of the existing filter. The air to cloth ratio or air to filter ratio shall not be increased when filter replacement is performed.

D. Maryville Carbon Solutions, LLC shall monitor and record the operating pressure drop across the baghouses at least once daily. Days with no production shall be indicated. The operating pressure drop shall be maintained within the design conditions specified by the dust collector and filter manufacturers' performance warranties.

E. Maryville Carbon Solutions, LLC shall maintain a copy of the dust collector and filter manufacturer's performance warranties on site.

F. Maryville Carbon Solutions, LLC shall maintain an operating and maintenance log for the dust collectors which shall include the following:
   1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
   2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

3) Dates of all above schedules, incidents, activities, and actions.

13. Control Device Requirement – Condensers
   A. Maryville Carbon Solutions, LLC shall control emissions from the pyrolysis unit (EU 17) by using two water cooled condensers (CD6 and CD7). The condensers shall be in use at all times while the pyrolysis unit is in operation. The condensers shall be operated and maintained in accordance with the manufacturer's specifications.

   B. Maryville Carbon Solutions, LLC shall maintain an operating and maintenance log for the condensers which shall include the following:
      1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
      2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
      3) Dates of all above schedules, incidents, activities, and actions.

14. Control Device Requirement – Combustion of Non-condensable Syngas
   A. Maryville Carbon Solutions, LLC shall control emissions from the condensers (non-condensable syngas) by using either a flare (EP 6) or pyrolysis heater (EP 12). The flare or pyrolysis heater shall be in use at all times while the pyrolysis unit is in operation. The flare and pyrolysis heater shall be operated and maintained in accordance with the manufacturer's specifications.

   B. The flare shall be operated according to 40 CFR 60.18(c) through (f), except (d) does not apply. In lieu of (d), the presence of a flare pilot flame shall be monitored using a thermocouple or any other equivalent device to detect the presence of a flame. If a flame cannot be maintained, the flame shall be supplemented with natural gas.

   C. The presence of a pyrolysis burner pilot flame shall be monitored using a thermocouple or any other equivalent device to detect the presence of a flame. If a flame cannot be maintained, the flame shall be supplemented with natural gas.

   D. Maryville Carbon Solutions, LLC shall maintain an operating and maintenance log for the flare and pyrolysis heater which shall include the following:
      1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
      2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
      3) Dates of all above schedules, incidents, activities, and actions.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

15. Operational Requirement – Synoil and VOC Materials
Maryville Carbon Solutions, LLC shall keep the synoil and all VOC containing materials in closed containers whenever the materials are not in use. Maryville Carbon Solutions, LLC shall provide and maintain suitable, easily read, permanent markings on all synoil and VOC material containers.

16. Record Keeping and Reporting Requirements
A. Maryville Carbon Solutions, LLC shall maintain all records required by this permit for not less than five years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request. These records shall include SDS for all materials used.

B. Maryville Carbon Solutions, LLC shall report to the Air Pollution Control Program's Compliance/Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, no later than 10 days after the end of the month during which any record required by this permit shows an exceedance of a limitation imposed by this permit.

17. Testing
A. Maryville Carbon Solutions, LLC shall test the total sulfur content of the non-condensable syngas, at a location prior to combustion in either the flare or pyrolysis heater.
1) Test method ASTM D-5504, or an alternative method preapproved by the Air Pollution Control Program Compliance/Enforcement Section shall be used.
2) Initial testing shall be performed within 90 days after this permit's issuance. Subsequent testing shall be performed at least once per month.
3) The results shall be used in Special Condition 2.

B. Maryville Carbon Solutions, LLC shall test the methylnaphthalene (2-) and anthracene content of each the light and heavy synoil.
1) A test method preapproved by the Air Pollution Control Program Compliance/Enforcement Section shall be used.
2) Initial testing shall be performed within 90 days after this permit's issuance. Subsequent testing shall be performed at least once per month.
3) The results shall be used in Special Conditions 3 and 4, respectively.

C. Maryville Carbon Solutions, LLC shall test EP 3 and EP 5 for the presence of pyrolysis gas.
1) A test method for VOC, sulfur, or other method that will indicate the presence of residual pyrolysis gas emitting from the pyrolysis unit and entering these locations shall be used.

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SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

2) Initial testing shall be performed within 90 days after this permit's issuance. If initial testing shows the presence of pyrolysis gas then Maryville Carbon Solutions, LLC shall submit an application to amend this permit within 90 days of the submittal of the test report in Special Condition 17.E. The application shall account for the emitted pyrolysis gas. If initial testing does not show the presence of pyrolysis gas then subsequent testing is not required.

D. A completed Proposed Test Plan Form (enclosed) shall be submitted to the Air Pollution Control Program 30 days prior to the proposed test date so that the Air Pollution Control Program may arrange a pretest meeting, if necessary, and assure that the test date is acceptable for an observer to be present. The Proposed Test Plan may serve the purpose of notification and shall be approved by the Director prior to conducting the required testing.

E. The initial test results report shall be submitted to the Compliance/Enforcement Section at stacktesting@dnr.mo.gov within 30 days of completion of any required testing. The report shall include legible copies of the raw data sheets, analytical instrument laboratory data, and complete sample calculations from the required test method for at least one sample run. Subsequent test results shall be maintained on site.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (5) REVIEW
Project Number: 2016-11-054
Installation ID Number: 147-0043
Permit Number: 042017-014

Installation Address:
Maryville Carbon Solutions, LLC
600 Wilson Industrial Blvd
Maryville, MO 64468

Parent Company:
Maryville Tire Solutions, LLC
1035 Pearl St, Ste 420
Boulder, CO 80302

Nodaway County, S16, T64N, R35W

REVIEW SUMMARY

- Maryville Carbon Solutions, LLC has applied for authority to install a new pyrolysis chamber, syngas flare, and tire shredding building at an existing tire pyrolysis facility.

- The application was deemed complete on December 15, 2016.

- HAP emissions are expected from the proposed equipment. HAPs of concern are PAH and sulfur compounds.

- NSPS
  - 40 CFR 60 Subpart CCCC, *Standards of Performance for Commercial and Industrial Solid Waste Incineration Units for Which Construction is Commenced After November 30, 1999 or for Which Modification or Reconstruction is Commenced After June 1, 2001*, does not apply. Tires that have been processed (shredded) will be used in the pyrolysis chamber. Therefore the tires are not solid waste, and the pyrolysis chamber is not an incinerator. No other incineration NSPS apply.

  - 40 CFR 60 Subpart NNN, *Standards of Performance for Volatile Organic Compound (VOC) Emissions From Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations*, does not apply. The installation does not produce any of the chemicals in §60.667. Although some of the chemicals may be present in the synoil product, the synoil CAS is not in §60.667. *Product* means any compound or chemical listed in §60.667 that is produced for sale as a final product as that chemical, or for use in the production of other chemicals or compounds. By-products, co-products, and intermediates are considered to be products.

  - 40 CFR 60 Subpart VVa, *Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006*, does not apply. The installation does not produce, as intermediates or

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- final products, any of the chemicals in §60.489. Although some of the chemicals may be present in the synoil product, the synoil CAS is not in §60.489.

- 40 CFR 60 Subpart RRR, *Standards of Performance for Volatile Organic Compound Emissions From Synthetic Organic Chemical Manufacturing Industry (SOCMI) Reactor Processes* does not apply. The installation does not produce any of the chemicals listed in §60.707 as a product, co-product, by-product, or intermediate. Although some of the chemicals may be present in the synoil product, the synoil CAS is not in §60.707.

- 40 CFR 60 Subpart GGGa, *Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006*, does not apply. The installation is not a *petroleum refinery*.

- 40 CFR 60 Subpart IIII, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*, applies to the emergency diesel engine.

- MACT
  - 40 CFR 63 Subpart VVVVVV, *National Emission Standards for Hazardous Air Pollutants for Chemical Manufacturing Area Sources*, does not apply. The installation does not process, use, or produce as a product or isolated intermediate any of the chemicals in Table 1 of the rule. Although some of the chemicals may be present in the synoil product, the heavy synoil is CAS 98219-79-5 and the light synoil is CAS 98219-81-9. These chemicals or CAS are not in Table 1 of the rule.

  - 40 CFR 63 Subpart MMMMMM, *National Emission Standards for Hazardous Air Pollutants for Carbon Black Production Area Sources*, does not apply. Although carbon black or a carbon black-like material may be produced, it is not produced using the furnace, thermal, or acetylene decomposition process. However, the installation's own SDS calls the recovered material carbon black CAS 1297477-28-1.

  - 40 CFR 63 Subpart ZZZZ, *National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*, applies to the emergency engine, however it meets all requirements of this subpart by meeting NSPS IIII.

- None of the NESHAPs under 40 CFR 61 apply.

- Dust collectors, condensers, and a flare are being used to control emissions.

- This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of $PM_{2.5}$ and SO_2 are conditioned below the deminimis level. Potential emissions of

- methylnaphthalene (2-) and anthracene are conditioned to not exceed the respective SMAL.

- This installation is located in Nodaway County, an attainment area for all criteria pollutants.

- List of Named Installations
  - This installation is on the List of Named Installations found in 10 CSR 10-6.020(3)(B), Table 2. The installation's major source level is 100 tons per year and fugitive emissions are counted toward major source applicability.

  - This installation is number 25, *charcoal production facilities*. The installation uses pyrolysis of a carbonaceous material to manufacture a char product. The definition of charcoal is not limited to being derived from wood for use in cooking.

  - The installation is not number 15, *carbon black plants (furnace process)*. The furnace process uses heavy oil as a feedstock to make carbon black. This installation is recovering carbon, gas, oils, steel, and fiber from tire feedstock, with oils not being reintroduced to a reactor to produce carbon black. However, the installation's own SDS calls the recovered material carbon black CAS 1297477-28-1.

  - The installation is not number 20, *chemical process plants*. According to an August 8, 1997 EPA applicability determination request concerning the definition of a chemical process plant,

    "This major group includes establishments producing basic chemicals, and establishments manufacturing products by predominantly chemical processes. Establishments in this major group manufacture three general classes of products: basic chemicals, such as acids, alkalies, salts, and organic chemicals; (2) chemical products to be used in further manufacture, such as synthetic fibers, plastics materials, dry colors, and pigments; and (3) finished chemical products to be used for ultimate consumption, such as drugs, cosmetics, and explosives."

    The chemical products of this tire pyrolysis plant are light and heavy synoils. The oils do not meet ASTM standards for traditional petroleum oils or chemicals. Therefore, based upon purity, it is assumed the oils do not meet any of the above three classes. The tire pyrolysis plant is not a chemical process plant.

- Ambient air quality modeling was not performed since potential emissions of the project are below de minimis levels and SMALs.

- Material testing is required for this permit.

- Typically, submittal of a Basic operating permit application is required within 30 days after a construction permit is issued for a source that is already operating. However, there is a proposed rulemaking to remove the requirement to obtain a Basic

- operating permit for de minimis installations if the only criteria triggering the operating permit is NSPS applicability. Contact the Air Pollution Control Program's Operating Permit Unit for an update prior to submitting an operating permit application.

- Approval of this permit is recommended with special conditions.

INSTALLATION DESCRIPTION

Maryville Carbon Solutions, LLC operates a tire pyrolysis installation in Maryville. The installation was previously operated by Carbolytic Materials Company, LLC. The installation is a deminimis source under NSR and does not have an operating permit. New equipment was installed prior to receipt of a construction permit. Maryville Carbon Solutions, LLC was retroactively issued a temporary construction permit for that equipment, while operating the existing equipment under the previously issued Carbolytic Materials Company, LLC permits. The following NSR permits have been issued to this installation from the Air Pollution Control Program.

Table 7: Permit History

Permit Number	Description
042009-010	Initial permit for Carbolytic Materials Company, LLC
042009-010A	Amendment for Carbolytic Materials Company, LLC to correct as-built changes, add de minimis SO_2 emission limit
012017-014	Temporary permit for Maryville Carbon Solutions, LLC
012017-014A	Amendment to temporary permit to extend expiration date

PROJECT DESCRIPTION

A replacement pyrolysis unit/chamber has been installed. It is rated at 27.5 tpd of tire shreds input at continuous operation. It is the bottleneck of the process. The pyrolysis reaction is supported by an indirect-fired burner rated at 4 MMBtu/hr input. The burner is fueled by natural gas or post-condenser syngas. A flare has replaced a combustion chamber. The flare is rated at 3.86 MMBtu/hr input. An additional area has been constructed for tire shredding and storage. Most of the shredding processes are controlled by dust collectors. The syngas condensers and char processing equipment are wholly unchanged from the previous owner. Maximum pyrolysis yields are summarized in Table 8. Installation emission units are summarized in Table 9.

Table 8: Maximum Pyrolysis Yields

Material	Yield (weight %)	Maximum Yield (tpd)
Tire shreds (input)	100%	27.5
Char	confidential	confidential
Syngas prior to condensers		
Syngas post condensers		
Oils		
Steel, fiber		

Yield (weight %) obtained from [redacted].
Maximum yield obtained by adding 3.5%.

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Table 9: Installation Emission Units

Emission Unit	Emission Point	Description
Multiple individual EU	EP 1 (CD 1 dust collector)	Primary tire shredder
		Primary shred tire storage
		Secondary tire shredder
		Secondary shred tire storage
	EP 14	Shreds into feed hopper
	EP 15	Confidential char finishing emission units
	EP 16	
Multiple individual EU	EP 5 (CD 4 dust collector)	
	EP 2 (CD 2 dust collector)	
	EP 3 (CD 3 dust collector)	
	EP 12	Pyrolysis heater
	EP 6	Flare
	EP 4	[redacted] combustion
	EP 11	Emergency diesel genset
	EP 13A	Haul roads: tire receiving
	EP 13B	Haul roads: diesel receiving
	EP 13C	Haul roads: pellet and byproduct shipping
	EP 7	Tank, light synoil 10,000 gal
	EP 8	Tank, heavy synoil (day tank) 1,000 gal
	EP 9	Tank, heavy synoil 18,000 gal
	EP 10	Tank, ULSD 10,000 gal
EU 17	N/A	Pyrolysis unit

N/A = Not applicable

Maryville Carbon Solutions, LLC requested confidentiality for the post-pyrolysis char processing. This is the redacted public permit. A confidential version is available under project 2016-11-055.

EMISSIONS/CONTROLS EVALUATION

The project conservatively recalculated potential emissions from the entire installation. Baseline actual emissions from existing emission units were not considered. Complete redacted PTE calculations are provided in the attached Excel file, calculation date 3/30/2017, which is incorporated by reference.

The feedstock is limited to tire shreds. Shreds equate to processed material, therefore the material is not solid waste. As the feedstock is not solid waste then the pyrolysis is not incineration. This determination was made by EPA Region 7.

Potential PM, PM_{10}, and $PM_{2.5}$ emissions from the dust collectors were calculated using grain/cf values obtained from the application. The application did not include uncaptured emissions from the corresponding emission units. Therefore a special condition was added requiring 100% capture efficiency. Demonstration of maximum flowrates is also required.

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Particulate matter HAPs were calculated from the dust collectors using weight concentrations obtained from the Scrap Tire Management Council. The concentrations were multiplied by the PM PTE.

The application did not include emissions from residual syngas coming with the char from the pyrolysis unit. Testing is required to confirm no syngas emits from the pyrolysis unit, except to the condensers.

The application did not include VOC or volatile HAP emissions from char rinsing/washing. [redacted] Since the application did not include these emissions, a special condition was added prohibiting [redacted].

The tanks' VOC PTE were obtained from the application. The HAP PTE was obtained from weight concentrations for synoil in the 2010 paper. The concentrations were multiplied by the VOC PTE. Unconditioned methylnaphthalene and anthracene emissions exceed the respective SMAL.

Potential emissions of SO_2 and all reduced sulfurs assume the worst case, that the flare and pyrolysis heater operate simultaneously at full capacity. Syngas sulfur content of 1% weight was obtained from the application. This value is reasonable considering values from the previous owner. Reduced sulfur emission factors were obtained from the previous permit. Testing of the syngas sulfur content is required. Syngas flowrate monitoring is required.

Complete PTE calculations are provided in the attached Excel file, calculation date 2/23/2017, which is incorporated by reference.

The following table provides an emissions summary for this project. Existing potential emissions were obtained from permits 042009-010 and 042009-010A. Existing actual emissions were obtained from the installation's 2015 EIQ. Potential emissions of the project represent the potential of the entire installation, assuming continuous operation (8,760 hours per year). The new installation conditioned potential represents voluntary limits to avoid ambient modeling at the time of permit issuance.

Table 10: Emissions Summary (tpy)

Pollutant	*De Minimis* / SMAL	Existing Potential Emissions	Existing Actual Emissions (2015 EIQ)	Potential Emissions of the Project	New Installation Conditioned Potential
PM	25.0	N/D	N/D	20.38	11.10
PM_{10}	15.0	< 15.0	2.33	18.86	10.27
$PM_{2.5}$	10.0	N/D	2.33	18.36	< 10.0
SO_2	40.0	< 39.0	2.10	47.05	< 40.0
NO_X	40.0	17.38	0.70	7.55	7.55
VOC	40.0	2.28	0.78	4.01	4.01
CO	100.0	6.73	0.34	9.01	9.01
H_2S	10.0	0.40	N/D	0.17	0.17
TRS	10.0	0.71	N/D	0.29	0.29
RSC	10.0	0.66	N/D	0.28	0.28
Fluorides excluding HF	3.0	N/D	N/D	1.8E-04	1.8E-04

GHG (CO_2e)	N/A	N/D	N/D	9007.05	9007.05
GHG (mass)	N/A	N/D	N/D	9059.98	9059.98
Combined HAPs	25.0	0.77	N/D	2.12	2.00
Carbonyl Sulfide	5.0	0.25	N/D	0.10	0.10
Carbon Disulfide	1.0	0.02	N/D	0.01	0.01
Hydrogen Chloride	10.0	N/D	N/D	0	0
Hexane	10.0	N/D	N/D	0.24	0.24
Benzene	2.0	N/D	N/D	0.32	0.32
Toluene	10.0	N/D	N/D	0.32	0.32
Ethyl Benzene	10.0	N/D	N/D	0.25	0.25
Xylene	10.0	N/D	N/D	0.27	0.27
Styrene	1.0	N/D	N/D	0.35	0.35
Naphthalene	10.0	N/D	N/D	0.03	0.03
Methylnaphthalene (2-)	0.01	N/D	N/D	0.10	< 0.01
Anthracene	0.01	N/D	N/D	0.09	< 0.01
Manganese Compounds	0.8	N/D	N/D	0.07	0.07
Chromium 3 Compounds	5.0	N/D	N/D	1.8E-03	1.8E-03
Nickel Compounds	1.0	N/D	N/D	9.7E-04	9.7E-04
Cadmium Compounds	0.01	N/D	N/D	1.1E-04	1.1E-04
Lead Compounds	0.01	N/D	N/D	1.2E-03	1.2E-03

N/A = Not Applicable; N/D = Not Determined

PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required.* Potential emissions of $PM_{2.5}$ and SO_2 are conditioned below respective deminimis levels. Potential emissions of methylnaphthalene and anthracene are conditioned to the SMAL.

APPLICABLE REQUIREMENTS

Maryville Carbon Solutions, LLC shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific record keeping, monitoring, and reporting requirements. Compliance with these emission standards, based on information submitted in the application, has been verified at the time this permit was approved.

GENERAL REQUIREMENTS

- *Operating Permits*, 10 CSR 10-6.065
- *Start-Up, Shutdown, and Malfunction Conditions,* 10 CSR 10-6.050
- *Submission of Emission Data, Emission Fees and Process Information,* 10 CSR 10-6.110

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- Per 10 CSR 10-6.110(4)(B)2.B(II) and (4)(B)2.C(II) a full EIQ is required for the first full calendar year the equipment (or modifications) approved by this permit are in operation.

- *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*, 10 CSR 10-6.170

- *Restriction of Emission of Visible Air Contaminants*, 10 CSR 10-6.220

- *Restriction of Emission of Odors*, 10 CSR 10-6.165

SPECIFIC REQUIREMENTS

- *Restriction of Emission of Particulate Matter From Industrial Processes*, 10 CSR 10-6.400 does not apply. Emission units are either fugitive, have a PM PTE less than 0.5 lb/hr, or are subject to a requirement to operate a capture/ control device system rated at least 90% PM efficient.

- *New Source Performance Regulations*, 10 CSR 10-6.070
  - 40 CFR 60 Subpart IIII, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*, applies to the emergency diesel engine.

- *MACT Regulations*, 10 CSR 10-6.075
  - 40 CFR 63 Subpart ZZZZ, *National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*

- *Restriction of Emission of Sulfur Compounds*, 10 CSR 10-6.260 applies to the flare and pyrolysis heater. They are in compliance. See the incorporated by reference Excel file for calculations. The regulation was rescinded from the CSR. However, it remains in the SIP and is therefore federally enforceable until the SIP is revised.

- *Control of Sulfur Dioxide Emissions*, 10 CSR 10-6.261. The pyrolysis heater is in compliance. The regulation applies to the flare but there is no standard.

- *Restriction of Particulate Matter Emissions From Fuel Burning Equipment Used for Indirect Heating*, 10 CSR 10-6.405, applies to the pyrolysis heater. It is in compliance assuming the AP-42 natural gas external combustion particulate matter emission factors apply to non-condensable syngas.

STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (5), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, it is recommended that this permit be granted with special conditions.

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated November 28, 2016, received November 28, 2016, designating Maryville Tire Solutions, LLC as the owner and operator of the installation.
- 2016-11-054 draft 2.pdf
- 2016-11-054.xlsx calculation date 3/30/2017

The following documents are permit references:

- U.S. EPA, *AP-42: Compilation of Air Emission Factors*, Fifth Edition
- U.S. EPA, webFIRE, https://www.epa.gov/electronic-reporting-air-emissions/webfire
- Rubber Manufacturers Association, Scrap Tire Management Council, Scrap Tire Characteristics

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APPENDIX A

Abbreviations and Acronyms

% ..... percent
°F ..... degrees Fahrenheit
acfm ..... actual cubic feet per minute
BACT ..... Best Available Control Technology
BMPs ..... Best Management Practices
Btu ..... British thermal unit
CAM ..... Compliance Assurance Monitoring
CAS ..... Chemical Abstracts Service
CEMS ..... Continuous Emission Monitor System
CFR ..... Code of Federal Regulations
CO ..... carbon monoxide
CO_2 ..... carbon dioxide
CO_2e ..... carbon dioxide equivalent
COMS ..... Continuous Opacity Monitoring System
CSR ..... Code of State Regulations
dscf ..... dry standard cubic feet
EIQ ..... Emission Inventory Questionnaire
EP ..... Emission Point
EPA ..... Environmental Protection Agency
EU ..... Emission Unit
fps ..... feet per second
ft ..... feet
GACT ..... Generally Available Control Technology
GHG ..... Greenhouse Gas
gpm ..... gallons per minute
gr ..... grains
GWP ..... Global Warming Potential
HAP ..... Hazardous Air Pollutant
hr ..... hour
hp ..... horsepower
lb ..... pound
lbs/hr ..... pounds per hour
MACT ..... Maximum Achievable Control Technology
$\mu g/m^3$ ..... micrograms per cubic meter
m/s ..... meters per second
Mgal ..... 1,000 gallons
MW ..... megawatt
MHDR ..... maximum hourly design rate
MMBtu .... Million British thermal units
MMCF ..... million cubic feet
MSDS ..... Material Safety Data Sheet
NAAQS .... National Ambient Air Quality Standards
NESHAPs National Emissions Standards for Hazardous Air Pollutants
NO_x ..... nitrogen oxides
NSPS ..... New Source Performance Standards
NSR ..... New Source Review
PM ..... particulate matter
$PM_{2.5}$ ..... particulate matter less than 2.5 microns in aerodynamic diameter
PM_{10} ..... particulate matter less than 10 microns in aerodynamic diameter
ppm ..... parts per million
PSD ..... Prevention of Significant Deterioration
PTE ..... potential to emit
RACT ..... Reasonable Available Control Technology
RAL ..... Risk Assessment Level
SCC ..... Source Classification Code
scfm ..... standard cubic feet per minute
SDS ..... Safety Data Sheet
SIC ..... Standard Industrial Classification
SIP ..... State Implementation Plan
SMAL ..... Screening Model Action Levels
SO_x ..... sulfur oxides
SO_2 ..... sulfur dioxide
tph ..... tons per hour
tpy ..... tons per year
VMT ..... vehicle miles traveled
VOC ..... Volatile Organic Compound

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Installation: Maryville Carbon Solutions, formerly Carbolytic Materials
ID: 147-0043
Calculation Date: 3/30/2017
Project Description: new building, shredding, wire removal
replace pyrolysis chamber
replace combustion chamber with flare
new compressor and compressed gas tank

this is the redacted public version. See 2016-11-055 for confidential info.

PM2.5 Compliance Tracking Composite Emission Factors

EU	EP	Description	EF	EF units	Composite EF	Composite EF units
several individual EU	EP 1	primary tire shredder primary shred tire storage secondary tire shredder secondary shred tire storage	0.8418367	lb/ton shreds	0.848	lb/ton tires or shreds
	EP 14	shreds into feed hopper	0.0003109	lb/ton shreds		
	EP 15					
	EP 16					
several individual EU	EP 5					lb/ton char
	EP 2					
	EP 3					
	EP 12	pyrolysis heater	7.6	lb / mmcf gas input	7.6	lb / mmcf gas input
	EP 6	flare	7.6	lb / mmcf gas input	7.6	lb / mmcf gas input
	EP 4					lb / mmcf gas input
	EP 11	emergency diesel genset	0.0061167	lb/gal input	6.12E-03	lb/gal input
	EP 13A	haul roads: tire receiving	0.0055454	lb/ton tire received	part of tires / shreds	
	EP 13B	haul roads: diesel receiving	0.0055454	lb/ton diesel received	1.95E-05	lb/gal received
	EP 13C	haul roads: pellet and byproduct shipping	0.0055454	lb/ton pellet and product shi	part of char	
	EP 7	tank, light synoil	0		n/a	n/a
	EP 8	tank, heavy synoil day	0		n/a	n/a
	EP 9	tank, heavy synoil	0		n/a	n/a
	EP 10	tank, diesel	0		n/a	n/a
EU 17		pyrolysis unit	EU not an EP		n/a	n/a

SO2 Compliance Tracking Emission Factors

EU	EP	Description	EF	EF units	
	EP 12	pyrolysis heater	1638.3633	lb / mmcf gas input	use future testing and apply equation
	EP 6	flare	1638.3633	lb / mmcf gas input	use future testing and apply equation
	EP 4			lb / mmcf gas input	
	EP 11	emergency diesel genset	2.12E-04	lb / gal	

2 Methylnaphthalene Compliance Tracking Emission Factors

EU	EP	Description	EF	EF units	
	EP 12	pyrolysis heater	2.40E-05	lb / mmcf	
	EP 6	flare	2.40E-05	lb / mmcf	
	EP 4			lb / mmcf	
	EP 7	tank, light synoil	4.80E-04	lb / gal	use future testing and apply equation
	EP 8	tank, heavy synoil day	1.13E-06	lb / gal	use future testing and apply equation
	EP 9	tank, heavy synoil	1.13E-06	lb / gal	use future testing and apply equation

Anthracene Compliance Tracking Emission Factors

EU	EP	Description	EF	EF units	
	EP 12	pyrolysis heater	2.40E-06	lb / mmcf	
	EP 6	flare	2.40E-06	lb / mmcf	
	EP 4			lb / mmcf	
	EP 7	tank, light synoil	4.32E-04	lb / gal	use future testing and apply equation
	EP 8	tank, heavy synoil day	1.02E-06	lb / gal	use future testing and apply equation
	EP 9	tank, heavy synoil	1.02E-06	lb / gal	use future testing and apply equation
	EP 11	emergency diesel genset	2.52E-06	lb / gal	

Installation-wide PTE (tpy)

pollutant	shreds, char handling	pyrolysis heater	flare	dryer	tanks	emergency genset	haul roads	total	de minimins / SMAL	action needed?	limited pte
PM	18.27	0.03	0.03	0.08		0.03	1.94	20.38	25		11.10
PM10	17.71	0.13	0.11	0.33		0.03	0.55	18.86	15	limit or model	10.27
PM2.5	17.71	0.13	0.11	0.33		0.03	0.06	18.36	10	limit or model	< 10
SO2		23.92	23.10	0.03		0.0010		47.05	40	limit or model	< 40
NOx		1.35	1.31	4.29		0.60		7.55	40	0	7.55
VOC		0.09	0.08	0.24	3.3804	0.22		4.01	40	0	4.01
CO		2.75	2.65	3.61				9.01	100	0	9.01
H2S		0.08	0.08	0				0.17	10	0	0.17
TRS		0.15	0.14	0				0.29	10	0	0.29
RSC		0.14	0.14	0				0.28	10	0	0.28
Fluoride	1.83E-04							0.0002	3	0	1.8E-04
CO2		2,061.18	1,692.18	5,152.94		100.41		9006.71			9006.71
CH4		0.04	0.03	0.10		0.00		0.17			0.17
N2O		0.04	0.03	0.09		0.00		0.16			0.16
GHG mass		2,061.25	1,692.24	5,153.13		100.42		9007.05			9007.05
GHG co2e		2,073.43	1,702.23	5,183.56		100.76		9059.98	75000	0	9059.98
Combined HAP		0.10	0.08	0.08	1.85731	0.0023821		2.12	25	0	2.00
COS		0.05	0.05	0				0.10	5	0	0.10
Carbon Disulfide		0.003	0.003	0				0.01	1	0	0.01
HCL		0	0	0				0	10	0	0.00
Hexane		0.03	0.03	0.08	0.10985			0.24	10	0	0.24
Benzene		3.61E-05	2.96E-05	9.02E-05	0.3211	0.0005713		0.32	2	0	0.32
Toluene		5.84E-05	4.79E-05	1.46E-04	0.3211	0.0002504		0.32	10	0	0.32
Ethyl Benzene		0	0	0	0.2535			0.25	10	0	0.25
Xylene		0	0	0	0.2704	0.0001745		0.27	10	0	0.27
Styrene		0	0	0	0.3549			0.35	1	0	0.35
Naphthalene		1.05E-05	8.60E-06	2.62E-05	0.0338	5.192E-05		0.03	10	0	0.03
2 Methyl Naphthalene		4.12E-07	3.38E-07	1.03E-06	0.1014			0.10	0.01	limit or model	< 0.01
Anthracene		4.12E-08	3.38E-08	1.03E-07	0.09126	1.145E-05		0.09	0.01	limit or model	< 0.01
Manganese	6.82E-02							0.07	0.8	0	0.07
Chromium 3	1.81E-03							0.0018	5	0	1.8E-03
Nickel	9.74E-04							0.0010	1	0	9.7E-04
Cadmium	1.10E-04							0.0001	0.01	0	1.1E-04
Lead	1.19E-03							0.0012	0.01	0	1.2E-03

note

rsc, h2s, trs, so2 are maxed out based upon total mhdr at 100% syngas for flare and burner

all pte at 8760

Emission Unit	Emission Point	Description	SCC	Material	MHDR true (tph)	MHDR annual bottlenecked (tph)	MHDR (cfm)	Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Available Emissions (lb/hr)	Control Device	Capture Efficiency	Control Efficiency	PTE (lb/hr)	PTE (tpy)
several	EP 1	primary tire shredder	3-01-005-99	tire shreds	2	1.15	12000	PM	0.02			2.057				2.057	9.01
		primary shred tire storage						PM10	0.02			2.057				2.057	9.01
		secondary tire shredder	secondary shredder rated at 2 tph					PM2.5	0.02		applicant	2.057				2.057	9.01
		secondary shred tire storage						Fluoride	2.00E-07			2.06E-05				0.0000	0.000
			compliance tracking EF (lb pm2.5 /ton)					Manganese	1.40E-04			1.44E-02				0.0144	0.063
			0.842					Chromium 3	2.00E-06			2.06E-04				0.0002	0.001
								Nickel	2.00E-06			2.06E-04			controlled	0.0002	0.001
			33.6 tons of tires to yield,					Cadmium	1.20E-07		scrap tire	1.23E-05	CD 1 dust		emission	0.0000	0.000
			27.5 tons of pyrolysis input					Lead	1.30E-06	grains/cf	management council	1.34E-04	collector	100%	factor	0.0001	0.001

Emission Unit	Emission Point	Description	SCC	Material	MHDR true (tph)	MHDR bottlenecked (tph)	MHDR (scfm)	Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Available Emissions (lb/hr)	Control Device	Capture Efficiency	Control Efficiency	PTE (lb/hr)	PTE (tpy)
	EP 14	shreds into feed hopper	3-01-005-99	tire shreds	n/d	1.15	n/a	PM	0.003		AP-42 Table 11.19.2-2,	0.0034	n/a	n/a	n/a	0.0034	0.0151
								PM10	0.0011		Conveyor Transfer	0.0013				0.0013	0.0055
								PM2.5	0.000311		Point, SCC 30502006	0.0004				0.0004	0.0016
								Fluoride	3.0E-08			3.44E-08				0.0000	2E-07
			compliance tracking EF (lb pm2.5 /ton)					Manganese	2.1E-05			2.41E-05				0.0000	0.0001
			0.00031087					Chromium 3	3.0E-07			3.44E-07				0.0000	2E-06
								Nickel	3.0E-07			3.44E-07				0.0000	2E-06
								Cadmium	1.8E-08		scrap tire	2.06E-08				0.0000	9E-08
								Lead	2.0E-07	lb/ton	management council	2.23E-07				0.0000	1E-06

Emission Unit	Emission Point	Description	SCC	Material	MHDR true (tph)	MHDR bottlenecked (tph)	MHDR (scfm)	Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Available Emissions (lb/hr)	Control Device	Capture Efficiency	Control Efficiency	PTE (lb/hr)	PTE (tpy)
	EP 15											0.1637	n/a	n/a	n/a	0.1637	0.717
												0.0393				0.0393	0.172
												0.0393				0.0393	0.172
												2E-06				0.0000	7E-06
												1E-03				0.0011	5E-03
												2E-05				0.0000	7E-05
												2E-05				0.0000	7E-05
												1E-06				0.0000	4E-06
												1E-05				0.0000	5E-05

Emission Unit	Emission Point	Description	SCC	Material	MHDR true (tph)	MHDR bottlenecked (tph)	MHDR (scfm)	Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Available Emissions (lb/hr)	Control Device	Capture Efficiency	Control Efficiency	PTE (lb/hr)	PTE (tpy)
	EP 16											0.0002	n/a	n/a	n/a	2.1E-04	0.001
												0.0001				7.8E-05	0.0003
												0.00002				2.2E-05	0.0001
												0.E+00				0.E+00	0.E+00
												1.E-06				1.E-06	7.E-06
												2.E-08				2.E-08	9.E-08
												2.E-08				2.E-08	9.E-08
												0.E+00				0.E+00	0.E+00
												0.E+00				0.E+00	0.E+00

Emission Unit	Emission Point	Description	SCC	Material	MHDR true (tph)	MHDR bottlenecked (tph)	MHDR (scfm)	Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Available Emissions (lb/hr)	Control Device	Capture Efficiency	Control Efficiency	PTE (lb/hr)	PTE (tpy)
several	EP 5											0.623				0.623	2.73
												0.623				0.623	2.73
												0.623				0.623	2.73
												6.23E-06				6.E-06	3.E-05
												0.00E+00				0.E+00	0.E+00
												6.10E-05				6.E-05	3.E-04
												0.00E+00			controlled	0.E+00	0.E+00
												3.74E-06	CD 4 dust		emission	4.E-06	2.E-05
												4.05E-05	collector	100%	factor	4.E-05	2.E-04

Emission Unit	Emission Point	Description	SCC	Material	MHDR true (tph)	MHDR bottlenecked (tph)	MHDR (scfm)	Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Available Emissions (lb/hr)	Control Device	Capture Efficiency	Control Efficiency	PTE (lb/hr)	PTE (tpy)
	EP 2											0.440				0.440	1.93
												0.440				0.440	1.93
												0.440				0.440	1.93
												4.40E-06				4E-06	2E-05
												0.00E+00				0E+00	0E+00
												4.32E-05				4E-05	2E-04
												0.00E+00			controlled	0E+00	0E+00
												2.64E-06	CD 2 dust		emission	3E-06	1E-05
												2.86E-05	collector	100%	factor	3E-05	1E-04

Emission Unit	Emission Point	Description	SCC	Material	MHDR true (tph)	MHDR bottlenecked (tph)	MHDR (scfm)	Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Available Emissions (lb/hr)	Control Device	Capture Efficiency	Control Efficiency	PTE (lb/hr)	PTE (tpy)
	EP 3															0.883	3.87
																0.883	3.87
																0.883	3.87
																9.E-06	4.E-05
																0.E+00	0.E+00
																9.E-05	4.E-04
															controlled	0.E+00	0.E+00
													CD 3 dust		emission	5.E-06	2.E-05
													collector	100%	factor	6.E-05	3.E-04

	pte tpy
pm	18.27
pm10	17.71
pm2.5	17.71
fluoride	2.E-04
manganese	7.E-02
chromium	2.E-03
nickel	1.E-03
cadmium	1.E-04
lead	1.E-03

	table 3 yield mass	avg tph	max (tph)	max (tpd)	max lb/hr
tires input (tpd)					
char					
gas prior to cond					
gas post condensor					[redacted]
oils					
steel, fiber					

this is what the pyrolysis unit can handle on a continuous basis. Up and downstream are faster.

[redacted]

"Normal operation will be continuous with shutdown and startup once per month for approximately 3 days."

	wt%
chromium	0.0098%
fluoride	0.0010%
cadmium	0.0006%
lead	0.0065%

rubber manufacturers association, scrap tire management council
values are for TDF, assumed same for shreds and char

	wt%	
manganese	0.70%	
chromium	0.01%	trace assumed 0.01%
nickel	0.01%	trace assumed 0.01%

rubber manufacturers association, scrap tire management council
steel tire, astm 1070

Emission Unit	Emission Point	Description	Gas HHV (Btu/cf)	MHDR (MMBtu/hr input)	MHDR (MMcf/hr)
	EP 12	natural gas	1,020	[redacted]	0.00392
		non-condensable syngas	1200		0.00333

[redacted] temporary permit

non-condensable syngas, other properties			
syngas density (lb/cf)	post condensor syngas sulfur content (wt%)	input at 4 MMBtu (lb/hr)	input at "3.5% max"
0.082	1%	[redacted]	[redacted]

lb/hr	2012-01-046	this permit
so2	25.80	5.46
h2s	0.0913	0.019
trs	0.1617	0.034
rsc	0.1512	0.032
cos	0.0562	0.012
carbon disulfide	0.0037	0.00077

MW sulfur	MW SO2	mw no2	mw co
32.07	64.07	46.01	28.01

mfg guarantee	ppmv	exhaust scfm	lb/hr
nox	30	1437.6	0.31
co	100	1437.6	0.63

constant
1.55831E-07

100yr GWP 40 CFR 98 Table A-1, Jan 1 2014

CO2	1
CH4	25
N2O	298

	Pollutant	CAS	HAP?	Emission Factor (lb / mmcf)	Emission Factor Source (SCC)	Available Pollutant (lb/hr)	Control Device	PTE (lb/hr)	PTE (tpy)
	PM filterable			1.9	1-02-006-02 industrial boiler, natural gas, 10-100MMBtu and 1-02-006-03 < 10MMBtu. SO2, nox, co from applicant. TRS, RSC, COS, carbon disulfide from project ratio 2012-01-046.	0.0075	none	0.0075	0.03
	PM10			7.6		0.0298	none	0.0298	0.13
	PM2.5			7.6		0.0298	none	0.0298	0.13
	SO2			1638.3633		5.4612	none	5.4612	23.92
	NOx			92.76		0.3092	none	0.3092	1.35
	VOC			5.5		0.0216	none	0.0216	0.09
	CO			188.24		0.6275	none	0.6275	2.75
	H2S			5.80		0.0193	none	0.0193	0.08
	TRS			10.27		0.0342	none	0.0342	0.15
	RSC			9.60		0.0320	none	0.0320	0.14
	Combined HAPs			5.691		0.0223	none	0.0223	0.10
	COS		y	3.571		0.0119	none	0.0119	0.05
	carbon disulfide		y	0.232		0.00077	none	0.0008	0.0034
	POM aggregate group			6.98E-04		2.74E-06	none	2.74E-06	1.20E-05
pom	2-Methylnaphthalene	91-57-6	y	2.40E-05		9.412E-08	none	9.41E-08	4.12E-07
pom	3-Methylchloranthrene	56-49-5	y	1.80E-06		7.059E-09	none	7.06E-09	3.09E-08
pom	7,12-Dimethylbenzanthracene	57-97-6	y	1.60E-05		6.275E-08	none	6.27E-08	2.75E-07
pom	Acenaphthene	83-32-9	y	1.80E-06		7.059E-09	none	7.06E-09	3.09E-08
pom	Acenaphthylene	203-96-8	y	1.80E-06		7.059E-09	none	7.06E-09	3.09E-08
pom	Anthracene	120-12-7	y	2.40E-06		9.412E-09	none	9.41E-09	4.12E-08
pom	Benzanthracene	56-55-3	y	1.80E-06		7.059E-09	none	7.06E-09	3.09E-08
	Benzene	71-43-2	y	2.10E-03		8.235E-06	none	8.24E-06	3.61E-05
pom	Benzo(a)pyrene	50-32-8	y	1.20E-06		4.706E-09	none	4.71E-09	2.06E-08
pom	Benzo(b)fluoranthene	205-99-2	y	1.80E-06		7.059E-09	none	7.06E-09	3.09E-08
pom	Benzo(g,h,i)perylene	191-24-2	y	1.20E-06		4.706E-09	none	4.71E-09	2.06E-08
pom	Benzo(k)fluoranthene	205-82-3	y	1.80E-06		7.059E-09	none	7.06E-09	3.09E-08
	Butane	106-97-8		2.10E+00		8.235E-03	none	8.24E-03	3.61E-02
pom	Chrysene	218-01-9	y	1.80E-06		7.059E-09	none	7.06E-09	3.09E-08
pom	Dibenzo(a,h)anthracene	53-70-3	y	1.20E-06		4.706E-09	none	4.71E-09	2.06E-08
	Dichlorobenzene	25321-22-6	y	1.20E-03		4.706E-06	none	4.71E-06	2.06E-05
	Ethane	74-84-0		3.10E+00		1.216E-02	none	1.22E-02	5.32E-02
pom	Fluoranthene	206-44-0	y	3.00E-06		1.176E-08	none	1.18E-08	5.15E-08
pom	Fluorene	86-73-7	y	2.80E-06		1.098E-08	none	1.10E-08	4.81E-08
	Formaldehyde	50-00-0	y	7.50E-02		2.941E-04	none	2.94E-04	1.29E-03
	Hexane	110-54-3	y	1.80E+00		7.059E-03	none	0.0071	0.03
pom	Indeno(1,2,3-cd)pyrene	193-39-5	y	1.80E-06		7.059E-09	none	7.06E-09	3.09E-08
pom	Naphthalene	91-20-3	y	6.10E-04		2.392E-06	none	2.39E-06	1.05E-05
	Pentane	109-66-0		2.60E+00		1.020E-02	none	1.02E-02	4.47E-02
pom	Phenanathrene	85-01-8	y	1.70E-05		6.667E-08	none	6.67E-08	2.92E-07
	Propane	74-98-6		1.60E+00		6.275E-03	none	6.27E-03	2.75E-02
pom	Pyrene	129-00-0	y	5.00E-06		1.961E-08	none	1.96E-08	8.59E-08
	Toluene	108-88-3	y	3.40E-03		1.333E-05	none	1.33E-05	5.84E-05
	Arsenic	7440-38-2	y	2.00E-04		7.843E-07	none	7.84E-07	3.44E-06
	Barium	7440-39-3		4.40E-03		1.725E-05	none	1.73E-05	7.56E-05
	Beryllium	7440-41-7	y	1.20E-05		4.706E-08	none	4.71E-08	2.06E-07
	Cadmium	7440-43-9	y	1.10E-03		4.314E-06	none	4.31E-06	1.89E-05
	Chromium	7440-47-3	y	1.40E-03		5.490E-06	none	5.49E-06	2.40E-05
	Cobalt	7440-48-4	y	8.40E-05		3.294E-07	none	3.29E-07	1.44E-06
	Copper	7440-50-8		8.50E-04		3.333E-06	none	3.33E-06	1.46E-05
	Manganese	7439-96-5	y	3.80E-04		1.490E-06	none	1.49E-06	6.53E-06
	Mercury	7439-97-6	y	2.60E-04		1.020E-06	none	1.02E-06	4.47E-06
	Molybdenum	7439-98-7		1.10E-03		4.314E-06	none	4.31E-06	1.89E-05
	Nickel	7440-02-0	y	2.10E-03		8.235E-06	none	8.24E-06	3.61E-05
	Selenium	7782-49-2	y	2.40E-05		9.412E-08	none	9.41E-08	4.12E-07
	Vanadium	7440-62-2		2.30E-03		9.020E-06	none	9.02E-06	3.95E-05
	Zinc	7440-66-6		2.90E-02		1.137E-04	none	1.14E-04	4.98E-04
	CO2			120,000		470.5882	none	470.588	2,061.18
	Methane			2.3		0.0090	none	0.0090	0.04
	N2O			2.2		0.0086	none	0.0086	0.04
	GHG (mass)								2,061.25
	GHG (CO2e)								2,073.43

compare vendor to AP-42

tpy ap-42	ap-42 lb/mmcf
1.72	100
[redacted]	[redacted]
1.44	84

Natural gas HHV of 1,020 Btu/cf cited from AP-42 Section 1.4, July 1998.
Dichlorobenzene group CAS 25321-22-6 conservatively assumed as 100% 1,4-dichlorobenzene CAS 106-46-7.

Emission Unit	Emission Point	Description	Gas HHV (Btu/cf)	MHDR (MMBtu/hr input)	MHDR (MMcf/hr)
	EP 6	flare	1,200	3.86	0.00322

non-condensable syngas, other properties			
syngas density (lb/cf)	post condensor syngas sulfur content (wt%)	given max syngas flowrate (lb/hr)	max flowrate based on "3.5% max"
0.082	1%		

lb/hr	2012-01-046	this permit
so2	25.80	5.27
h2s	0.0913	0.019
trs	0.1617	0.033
rsc	0.1512	0.031
cos	0.0562	0.011
carbon disulfide	0.0037	0.00075

MW sulfur	MW SO2	mw no2	mw co
32.07	64.07	46.01	28.01

mfg guarantee	ppmv	exhaust scfm	lb/hr
nox	30	1388	0.30
co	100	1388	0.61

constant
1.558E-07

100yr GWP 40 CFR 98 Table A-1, Jan 1 2014

CO2	1
CH4	25
N2O	298

	Pollutant	CAS	HAP?	Emission Factor (lb / mmcf)	Emission Factor Source (SCC)	Available Pollutant (lb/hr)	Control Device	PTE (lb/hr)	PTE (tpy)
	PM filterable			1.9	1-02-006-02 industrial boiler, natural gas, 10-100MM8tu and 1-02-006-03 < 10MMBtu. SO2, nox, co from applicant. TRS, RSC, COS, carbon disulfide from project ratio 2012-01-046.	0.0061	none	0.0061	0.03
	PM10			7.6		0.0245	none	0.0245	0.11
	PM2.5			7.6		0.0245	none	0.0245	0.11
	SO2			1638.3633		5.2747	none	5.2747	23.10
	NOx			92.76		0.2987	none	0.2987	1.31
	VOC			5.5		0.0177	none	0.0177	0.08
	CO			188.24		0.6060	none	0.6060	2.65
	H2S			5.80		0.0187	none	0.0187	0.08
	TRS			10.27		0.0331	none	0.0331	0.14
	RSC			9.60		0.0309	none	0.0309	0.14
	Combined HAPs			5.691		0.0183	none	0.0183	0.08
	COS		y	3.571		0.0115	none	0.0115	0.05
	carbon disulfide		y	0.232		0.00075	none	0.0007	0.0033
	POM aggregate group			6.98E-04		2.25E-06	none	2.25E-06	9.85E-06
pom	2-Methylnaphthalene	91-57-6	y	2.40E-05		7.727E-08	none	7.73E-08	3.38E-07
pom	3-Methylchloranthrene	56-49-5	y	1.80E-06		5.795E-09	none	5.80E-09	2.54E-08
pom	7,12-Dimethylbenzanthracene	57-97-6	y	1.60E-05		5.151E-08	none	5.15E-08	2.26E-07
pom	Acenaphthene	83-32-9	y	1.80E-06		5.795E-09	none	5.80E-09	2.54E-08
pom	Acenaphthylene	203-96-8	y	1.80E-06		5.795E-09	none	5.80E-09	2.54E-08
pom	Anthracene	120-12-7	y	2.40E-06		7.727E-09	none	7.73E-09	3.38E-08
pom	Benzanthracene	56-55-3	y	1.80E-06		5.795E-09	none	5.80E-09	2.54E-08
	Benzene	71-43-2	y	2.10E-03		6.761E-06	none	6.76E-06	2.96E-05
pom	Benzo(a)pyrene	50-32-8	y	1.20E-06		3.863E-09	none	3.86E-09	1.69E-08
pom	Benzo(b)fluoranthene	205-99-2	y	1.80E-06		5.795E-09	none	5.80E-09	2.54E-08
pom	Benzo(g,h,i)perylene	191-24-2	y	1.20E-06		3.863E-09	none	3.86E-09	1.69E-08
pom	Benzo(k)fluoranthene	205-82-3	y	1.80E-06		5.795E-09	none	5.80E-09	2.54E-08
	Butane	106-97-8		2.10E+00		6.761E-03	none	6.76E-03	2.96E-02
pom	Chrysene	218-01-9	y	1.80E-06		5.795E-09	none	5.80E-09	2.54E-08
pom	Dibenzo(a,h)anthracene	53-70-3	y	1.20E-06		3.863E-09	none	3.86E-09	1.69E-08
	Dichlorobenzene	25321-22-6	y	1.20E-03		3.863E-06	none	3.86E-06	1.69E-05
	Ethane	74-84-0		3.10E+00		9.980E-03	none	9.98E-03	4.37E-02
pom	Fluoranthene	206-44-0	y	3.00E-06		9.659E-09	none	9.66E-09	4.23E-08
pom	Fluorene	86-73-7	y	2.80E-06		9.015E-09	none	9.01E-09	3.95E-08
	Formaldehyde	50-00-0	y	7.50E-02		2.415E-04	none	2.41E-04	1.06E-03
	Hexane	110-54-3	y	1.80E+00		5.795E-03	none	0.0058	0.03
pom	Indeno(1,2,3-cd)pyrene	193-39-5	y	1.80E-06		5.795E-09	none	5.80E-09	2.54E-08
pom	Naphthalene	91-20-3	y	6.10E-04		1.964E-06	none	1.96E-06	8.60E-06
	Pentane	109-66-0		2.60E+00		8.371E-03	none	8.37E-03	3.67E-02
pom	Phenanathrene	85-01-8	y	1.70E-05		5.473E-08	none	5.47E-08	2.40E-07
	Propane	74-98-6		1.60E+00		5.151E-03	none	5.15E-03	2.26E-02
pom	Pyrene	129-00-0	y	5.00E-06		1.610E-08	none	1.61E-08	7.05E-08
	Toluene	108-88-3	y	3.40E-03		1.095E-05	none	1.09E-05	4.79E-05
	Arsenic	7440-38-2	y	2.00E-04		6.439E-07	none	6.44E-07	2.82E-06
	Barium	7440-39-3		4.40E-03		1.417E-05	none	1.42E-05	6.20E-05
	Beryllium	7440-41-7	y	1.20E-05		3.863E-08	none	3.86E-08	1.69E-07
	Cadmium	7440-43-9	y	1.10E-03		3.541E-06	none	3.54E-06	1.55E-05
	Chromium	7440-47-3	y	1.40E-03		4.507E-06	none	4.51E-06	1.97E-05
	Cobalt	7440-48-4	y	8.40E-05		2.704E-07	none	2.70E-07	1.18E-06
	Copper	7440-50-8		8.50E-04		2.737E-06	none	2.74E-06	1.20E-05
	Manganese	7439-96-5	y	3.80E-04		1.223E-06	none	1.22E-06	5.36E-06
	Mercury	7439-97-6	y	2.60E-04		8.371E-07	none	8.37E-07	3.67E-06
	Molybdenum	7439-98-7		1.10E-03		3.541E-06	none	3.54E-06	1.55E-05
	Nickel	7440-02-0	y	2.10E-03		6.761E-06	none	6.76E-06	2.96E-05
	Selenium	7782-49-2	y	2.40E-05		7.727E-08	none	7.73E-08	3.38E-07
	Vanadium	7440-62-2		2.30E-03		7.405E-06	none	7.40E-06	3.24E-05
	Zinc	7440-66-6		2.90E-02		9.337E-05	none	9.34E-05	4.09E-04
	CO2			120,000		386.3415	none	386.341	1,692.18
	Methane			2.3		0.0074	none	0.0074	0.03
	N2O			2.2		0.0071	none	0.0071	0.03
	GHG (mass)								1,692.24
	GHG (CO2e)								1,702.23

compare vendor to AP-42
ap-42 lb/mmcf
100

84

Dichlorobenzene group CAS 25321-22-6 conservatively assumed as 100% 1,4-dichlorobenzene CAS 106-46-7.
HAPs updated per "Air Pollution Control Program Table of Hazardous Air Pollutants, Screening Model Action Levels, and Risk Assessment Levels" Revision 11, 2/12/2015.

Emission Unit	Emission Point	Description	Natural Gas HHV (Btu/cf)	MHDR (MMBtu/hr input)	MHDR (MMcf/hr)		Pollutant	CAS	HAP?	Emission Factor (lb / mmcf)	Emission Factor Source (SCC)	Available Pollutant (lb/hr)	Control Device	PTE (lb/hr)	PTE (tpy)
	EP 4						PM filterable					0.0186	none	0.0186	0.08
							PM10					0.0745	none	0.0745	0.33
							PM2.5					0.0745	none	0.0745	0.33
							SO2					0.0059	none	0.0059	0.03
							NOx					0.9804	none	0.9804	4.29
							VOC					0.0539	none	0.0539	0.24
							CO					0.8235	none	0.8235	3.61
							Combined HAPs					0.0185	none	0.0185	0.08
							POM aggregate group					6.85E-06	none	6.85E-06	3.00E-05
						pom	2-Methylnaphthalene	91-57-6	y			2.353E-07	none	2.35E-07	1.03E-06
						pom	3-Methylchloranthrene	56-49-5	y			1.765E-08	none	1.76E-08	7.73E-08
						pom	7,12-Dimethylbenzanthracene	57-97-6	y			1.569E-07	none	1.57E-07	6.87E-07
						pom	Acenaphthene	83-32-9	y			1.765E-08	none	1.76E-08	7.73E-08
						pom	Acenaphthylene	203-96-8	y			1.765E-08	none	1.76E-08	7.73E-08
						pom	Anthracene	120-12-7	y			2.353E-08	none	2.35E-08	1.03E-07
						pom	Benzanthracene	56-55-3	y			1.765E-08	none	1.76E-08	7.73E-08
							Benzene	71-43-2	y			2.059E-05	none	2.06E-05	9.02E-05
						pom	Benzo(a)pyrene	50-32-8	y			1.176E-08	none	1.18E-08	5.15E-08
						pom	Benzo(b)fluoranthene	205-99-2	y			1.765E-08	none	1.76E-08	7.73E-08
						pom	Benzo(g,h,i)perylene	191-24-2	y			1.176E-08	none	1.18E-08	5.15E-08
						pom	Benzo(k)fluoranthene	205-82-3	y			1.765E-08	none	1.76E-08	7.73E-08
							Butane	106-97-8				2.059E-02	none	2.06E-02	9.02E-02
						pom	Chrysene	218-01-9	y			1.765E-08	none	1.76E-08	7.73E-08
						pom	Dibenzo(a,h)anthracene	53-70-3	y			1.176E-08	none	1.18E-08	5.15E-08
							Dichlorobenzene	25321-22-6	y			1.176E-05	none	1.18E-05	5.15E-05
							Ethane	74-84-0				3.039E-02	none	3.04E-02	1.33E-01
						pom	Fluoranthene	206-44-0	y			2.941E-08	none	2.94E-08	1.29E-07
						pom	Fluorene	86-73-7	y			2.745E-08	none	2.75E-08	1.20E-07
							Formaldehyde	50-00-0	y			7.353E-04	none	7.35E-04	3.22E-03
							Hexane	110-54-3	y			1.765E-02	none	0.0176	0.08
						pom	Indeno(1,2,3-cd)pyrene	193-39-5	y			1.765E-08	none	1.76E-08	7.73E-08
						pom	Naphthalene	91-20-3	y			5.980E-06	none	5.98E-06	2.62E-05
							Pentane	109-66-0				2.549E-02	none	2.55E-02	1.12E-01
						pom	Phenanathrene	85-01-8	y			1.667E-07	none	1.67E-07	7.30E-07
							Propane	74-98-6				1.569E-02	none	1.57E-02	6.87E-02
						pom	Pyrene	129-00-0	y			4.902E-08	none	4.90E-08	2.15E-07
							Toluene	108-88-3	y			3.333E-05	none	3.33E-05	1.46E-04
							Arsenic	7440-38-2	y			1.961E-06	none	1.96E-06	8.59E-06
							Barium	7440-39-3				4.314E-05	none	4.31E-05	1.89E-04
							Beryllium	7440-41-7	y			1.176E-07	none	1.18E-07	5.15E-07
							Cadmium	7440-43-9	y			1.078E-05	none	1.08E-05	4.72E-05
							Chromium	7440-47-3	y			1.373E-05	none	1.37E-05	6.01E-05
							Cobalt	7440-48-4	y			8.235E-07	none	8.24E-07	3.61E-06
							Copper	7440-50-8				8.333E-06	none	8.33E-06	3.65E-05
							Manganese	7439-96-5	y			3.725E-06	none	3.73E-06	1.63E-05
							Mercury	7439-97-6	y			2.549E-06	none	2.55E-06	1.12E-05
							Molybdenum	7439-98-7				1.078E-05	none	1.08E-05	4.72E-05
							Nickel	7440-02-0	y			2.059E-05	none	2.06E-05	9.02E-05
							Selenium	7782-49-2	y			2.353E-07	none	2.35E-07	1.03E-06
							Vanadium	7440-62-2				2.255E-05	none	2.25E-05	9.88E-05
							Zinc	7440-66-6				2.843E-04	none	2.84E-04	1.25E-03
							CO2					1176.4706	none	1176.471	5,152.94
							Methane					0.0225	none	0.0225	0.10
							N2O					0.0216	none	0.0216	0.09
							GHG (mass)								5,153.13
							GHG (CO2e)								5,183.56

	SO2 (lb/mmcf)	grains sulfur	scf	grs/cf
AP-42				
40 CFR 72.2				

100yr GWP 40 CFR 98 Table A-1, Jan 1 2014

CO2	1
CH4	25
N2O	298

Natural gas HHV of 1,020 Btu/cf cited from AP-42 Section 1.4, July 1998.
Dichlorobenzene group CAS 25321-22-6 conservatively assumed as 100% 1,4-dichlorobenzene CAS 106-46-7.
HAPs updated per "Air Pollution Control Program Table of Hazardous Air Pollutants, Screening Model Action Levels, and Risk Assessment Levels" Revision 11, 2/12/2015.

Emission Point	Description	VOC PTE (tpy)	(gal/yr) annual throughput corresponding to TANKS PTE	VOC emission factor (lb/gal)	total HAPs emission factor (lb/gal)	2- methylnaphthalene emission factor (lb/gal)	anthracene emission factor (lb/gal)
ep7	light synoil tank 10000 gal	3.36	420,000	0.016	8.79E-03	4.80E-04	4.32E-04
ep 8	heavy synoil tank 1000 gal	0.01	1,061,500	1.88E-05	2.07E-05	1.13E-06	1.02E-06
ep 9	heavy synoil tank 18000 gal	0.01	combined with EP 8				
ep10	diesel tank 10000 gal	0.0004	10,000	8.0E-05	8.0E-05	not determined	

voc pte tpy obtained from application
diesel haps pte assumed 100% of voc pte

hap % from Doug Smith 2010 paper, "Confirmation of American Combustion Technologies, Inc. Pyrolytic System for Pyrolysis Oil from Tire Feedstock" assuming oil is 100% voc

table 5		hap?	ep 7 pte	ep8 pte	ep9 pte	ep10	total tpy
(C5H12) n-Pentane 1.75%	1.75%					trace haps	
(C6H14) n-Hexane 3.25%	3.25%	y	0.1092	0.000325	0.000325		0.10985
(C7H16) n-Heptane 7.25%	7.25%						
(C6H6) Benzene 9.50%	9.50%	y	0.3192	0.00095	0.00095		0.3211
(C7H8)Toluene 9.50%	9.50%	y	0.3192	0.00095	0.00095		0.3211
(C8H10)Ethyl Benzene 7.50%	7.50%	y	0.252	0.00075	0.00075		0.2535
(C8H10) Xylene 8.00%	8%	y	0.2688	0.0008	0.0008		0.2704
(C8H8) Styrene 10.50%	10.50%	y	0.3528	0.00105	0.00105		0.3549
(C9H20) Nonane 2.00%	2%						
(C10H22) Decane 2.75%	2.75%						
(C10H16) Limonene 13.30%	13.30%						
(C11H24) Undecane 4.00%	4%						
(C10H8) Napthelene 1.00%	1%	y	0.0336	0.0001	0.0001		0.0338
(C11H10)Methyl Napthelene	3%	y	0.1008	0.0003	0.0003		0.1014
(C12H26) Dodecane 3.00%	3%						
(C13H28) Tridecane 4.00%	4%						
(C14H10) 2.70% anthracene	2.70%	y	0.09072	0.00027	0.00027		0.09126
Wax, as C19 7.00%	7%						
Total 100.00%	100.00%						1.85731

assumed same hap% for light and heavy oil, although likely different. Table 5 only had one set.
application has msds for light and heavy oil. Light oil shows hap %, but lower than table 5. table 5 therefore conservatively used.
table 5 doesn't specify methylnapthalene or 2-methylnapthalene. Molecular formula is for both. Assumed 2-.

Emission Unit	Emission Point	Description	MHDR (hp)	MHDR (gal/hr)	MHDR (MMBtu/hr input)	Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source	Available Pollutant (lb/hr)	Control Device	PTE (lb/hr)	PTE (tpy)
	EP 11	Cummins emergency diesel, see below	364	18.2	2.45	PM	0.20	gram/kwm	Nonroad Tier 3	0.1197	none	0.1197	0.03
						PM10	0.1915	gram/kwm		0.1146	none	0.1146	0.03
						PM2.5	0.1860	gram/kwm		0.1113	none	0.1113	0.03
						SOx	0.000212	lb / gal	mass balance	0.0038	none	0.0038	9.6E-04
						NOx	4.0	gram/kwm	Nonroad Tier 3	2.3937	none	2.3937	0.60
						TOC as VOC	0.36	lb / MMBtu	SCC 2-01-001-02	0.8817	none	0.8817	0.22
						CO	3.5	gram/kwm	Nonroad Tier 3	2.0945	none	2.0945	0.52
						Combined HAPs	3.89E-03	lb / MMBtu	AP-42 Table 3.3-2	0.0095	none	0.0095	2.4E-03
						Benzene	9.33E-04			0.00229	none	0.00229	5.7E-04
						Toluene	4.09E-04			0.00100	none	0.00100	2.5E-04
						Xylenes	2.85E-04			0.00070	none	0.00070	1.7E-04
						1,3-Butadiene	3.91E-05			0.00010	none	0.00010	2.4E-05
						Formaldehyde	1.18E-03			0.00289	none	0.00289	7.2E-04
						Acetaldehyde	7.67E-04			0.00188	none	0.00188	4.7E-04
						Acrolein	9.25E-05			0.00023	none	0.00023	5.7E-05
						Total PAH	1.85E-04			0.00045	none	0.00045	1.1E-04
						Naphthalene	8.48E-05			0.00021	none	0.00021	5.2E-05
						Acenaphthylene	5.06E-06			0.00001	none	0.00001	3.1E-06
						Acenaphthene	1.42E-06			0.00000	none	0.00000	8.7E-07
						Fluorene	2.92E-05			0.00007	none	0.00007	1.8E-05
						Phenanthrene	2.94E-05			0.00007	none	0.00007	1.8E-05
						Anthracene	1.87E-05			0.00005	none	0.00005	1.1E-05
						Fluoranthene	7.61E-06			0.00002	none	0.00002	4.7E-06
						Pyrene	4.78E-06			0.00001	none	0.00001	2.9E-06
						Benzo(a)anthracene	1.68E-06			0.00000	none	0.00000	1.0E-06
						Chrysene	3.53E-07			0.00000	none	0.00000	2.2E-07
						Benzo(b)fluoranthene	9.91E-08			0.00000	none	0.00000	6.1E-08
						Benzo(k)fluoranthene	1.55E-07			0.00000	none	0.00000	9.5E-08
						Benzo(a)pyrene	1.88E-07			0.00000	none	0.00000	1.2E-07
						Indeno(1,2,3-cd)pyrene	3.75E-07			0.00000	none	0.00000	2.3E-07
						Dibenz(a,h)anthracene	5.83E-07			0.00000	none	0.00000	3.6E-07
						Benzo(g,h,i)perylene	4.89E-07			0.00000	none	0.00000	3.0E-07
						CO2	164			401.6594	none	401.6594	100.41
						Methane	0.0030	kg/MMBtu	40 CFR 98 Subpart C, Table C-2	0.0162	none	0.0162	4.0E-03
						N2O	0.00060			0.0032	none	0.0032	8.1E-04
						GHG (mass)							100.42
						GHG (CO2e)							100.76

ULSD Sulfur Content (wt %)
0.0015%

ULSD HHV (Btu/gal)
134,568

ULSD Density (lb/gal)
7.05

hr/yr
500

100yr GWP 40 CFR 98 Table A-1, Jan 1 2014	
CO2	1
CH4	25
N2O	298

Cummins genset model DSHAD-7573697 A090230221 (Mfg. 11/2009). Engine is Cummins QSL9-G2, NR3. Engine 271.5 KWm, Tier 3.
Gal/hr fuel consumption based upon ULSD. Density cited from AP-42 Section 3.4. ULSD Diesel HHV reduced 1.1% on a volume basis from LSD, per "The Transition to Ultra-Low-Sulfur Diesel Fuel: Effects on Prices and Supply" US Energy Information Administration, Report SR-OIAF/2001-01, May 2001.

MACT ZZZZ

In service after June 11, 2006, therefore new stationary RICE.
New, emergency, area HAP source
Subject to NSPS IIII, no further MACT ZZZZ requirements.

NSPS IIII

60.4205 - comply with nonroad standards in 60.4202
60.4202 - comply with 40 CFR 89
60.4207 - fuel meets 40 CFR 80.510(b), ULSD
100 hours per year limit on maintenance and readiness testing, emergency demand response
50 hr/yr limit on non-emergency, but counts towards the 100 hours, and cannot be peak shaving, non-emergency demand response, or any other financial arrangement. Can be financial agreement if certain criteria are met.

Tier 3 Nonroad Emission Standards (gram/kwm)

max power	nmhc + nox	hc	nox	co	pm filt	engine kwm
225<kw<450	4.0	-	4.0	3.5	0.20	271.4

No standard for NOx, so NMHC + NOx conservatively applied to NOx.

PTE (lb/hr)

ap-42, 3.3	0.8817	-	10.8007	2.3267	0.7592
tier 3	2.3937	-	2.3937	2.0945	0.1197

AP-42 Table 3.4-2

Pollutant	lb/MMBtu
filt <1 micron	0.0478
filt <3 micron	0.0479
filt <10 micron	0.0496
total filterable	0.0620
condensable	0.0077

ratioed	
	gram/KWm
Tier PM	0.20
PM	0.20
PM10	0.1915
PM2.5	0.1860
cond	0.0315

pm cond conversion from lb/mmbtu to gram/kwm

9022.80	btu/kw.hr
0.0315	gram pm condensable / kwm.hr

Haul Road/Haul Truck/Material Hauled Information								
Haul Road ID No.:	1	2	3	4	5	6	7	8
W (tons):	28.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
s (%):	8.5							
P (days):	100							
E(PM2.5) (lbs/VMT):	0.3029							
E(PM10) (lbs/VMT):	3.0289							
E(PM30) (lbs/VMT):	10.6008							
Eext(PM2.5) (lbs/VMT):	0.2199							
Eext(PM10) (lbs/VMT):	2.1990							
Eext(PM30) (lbs/VMT):	7.6965							

E = k (s/12)^a * (W/3)^b where:
E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)

Constants for Equation

	Constant		
Particle Size	k(lb/VMT)	a	b
PM2.5	0.15	0.9	0.45
PM10	1.5	0.9	0.45
PM30	4.9	0.7	0.45

Eext = E[(365-P)/365] where E is defined above and:
Eext = annual size-specific emission factor extrapolated for natural mitigation (lb/VMT)
P = number of days in a year with at least 0.01 inch of precipitation

Is the proposed Maryville Carbon Solution (MCS) tire pyrolysis with syngas combustion subject to NSPS CCCC (CISWI)?

NHSM solid waste is defined in 40 CFR 241.
MCS will not handle hazardous waste, therefore not hazardous.
The waste is not "within control of the generator" as it's discarded and used tires.

40 CFR 60 Subpart CCCC
60.2010 A CISWI must meet all of the 3 following: new incineration unit per 60.2015, is a CISWI per 60.2265, is not exempt per 60.2020.
pyrolysis unit, syngas burner for pyrolysis unit, and waste flare will be "new"
burner and flare are not exempt as they aren't subject to another incinerator federal rule, not a small power production facility, not a material recovery unit as primary purpose is not metal recovery, not otherwise a boiler, sewage incinerator, etc
the remaining factor for burner and flare is determination as a CISWI per 60.2265

pyrolysis chamber
not a chemical recovery unit because not burning.
Pyrolysis needs to be continuously demonstrated not to be incineration per Feb 2, 2000 EPA Region 5 response to Indiana, "Pyrolysis Unit NSPS Definition".
Other NSPS Ea, Eb, EEEE call pyrolysis incineration.

burner and flare
although burning, not burning to recover chemical constituent or salable. They are burning to either make usable heat onsite or to destroy.
60.2265 "CISWI combusts...any solid waste as that term is defined in 40 CFR 241"
40 CFR 241 "solid waste means the term solid waste as defined in 40 CFR 258.2"
40 CFR 258.2 "solid waste means any garbage, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material..."
40 CFR 241.2 "contained means the NHSM is stored in a manner that adequately prevents releases or other hazards to human health and the environment..."
The pyrolysis gas is contained and combusted downstream. Therefore it is "contained gaseous material" and a solid waste. It is NHSM that is solid waste. The burner and flare are CISWI.

40 CFR 241.3(b)(4) not solid waste if "meet the legitimacy criteria in (d)(1) for fuel and (d)(2) for ingredient. The legitimacy criteria apply after the NHSM is processed to produce fuel or ingredient."
The tires are mechanically processed (shredder) then chemically processed (pyrolysis) to fuel (not sold) or synoil (sold) or char (sold), so legitimacy criteria can be examined.
(d)(1) (iii) "NHSM must contain contaminants at levels comparable in concentration or lower than those in traditional fuels, by direct comparison of the contaminant levels in each."
Tire syngas is not natural gas nor propane. They aren't selling it and industry typically has to clean it alot in order to meet traditional fuel specs. MCS hasn't yet made the comparison for this project.
At this time the syngas does not meet the legitimacy criteria for fuel and therefore is a NHSM that is a solid waste?
(d)(2)(iv) "The NHSM must result in products that contain contaminants at levels that are comparable in conc. to or lower than those found in traditional products that are manufactured w/o the NHSM."
Other information sources have indicated biofuels and biogases from tires do not meet the ASTM specifications for the traditional product. MCS has yet to test their product contaminant levels and make the comparison.
At this time the tires / syngas / synoil does not meet the legitamacy criteria for ingredients and therefore is a NHSM that is a solid waste?
MCS would have to make the comparison for the char also?
241.3(c) Applicant may petition the Regional Admininstrator for a NHSM that is a solid waste determination.

feb 2011 CISWI public comments and responses:
Court upheld that "solid waste incineration unit"....any facility that combusts any solid waste material...except for the 4 inclusions in CAA section 129 g 1.
MCS does not meet any of the 4 exceptions, therefore is a "solid waste incineration unit"
1) not an incinerator or other unit required to have a permit under section 3005 of solid waste disposal act - if it was an incinerator, then it's subject to CISWI or other NSPS
2) not a material recovery facility that combusts waste for the primary purpose of recovering metals
3) not a qualifying small power production facility, as emergency genset is not power production in section 3(17)(C) of the Federal Power Act (16 U.S.C. 796(17)(C)).
4) not an air curtain incinerator

SIC - waste disposal/minimizing vs chemical process plant vs electrical generation, ratio of tipping fees vs chemical sales, etc. There can be NSPS/MACT requirements for each of these SIC.

February 2011 CISIW comment concerning proposed rule's relationship to pyrolysis and gasification units:
EPA response "See the applicability sections of the regulations and the NHSM rule to determine is these sources are subject to regulation under CISWI." already did that and answer seems tire pyrolysis with syngas being combusted is CISWI

For further information on the CISWI reconsideration and final amendments contact Ms. Toni Jones, Fuels and Incineration Group, Sector Policies and Programs Division (E143-05), EPA, Research Triangle Park, North Carolina 27711. jones.toni@epa.gov or Ms. Amy Hambrick hambrick.amy@epa.gov

For further information regarding the NHSM final rule contact Mr. George Faison, Program Implementation and Information Division, Office of Resource Conservation and Recovery, 5303P, EPA, Ariel Rios Building, 1200 Pennsylvania Ave NW, Washington DC 20460-0002 faison.george@epa.gov.

see other states permits since 2011. ask region 7. emailed epa questions on 12/20/2016.

2013-02-07 CISWI final, "whole tires (not discarded) obtained from **approved tire management programs**...not considered solid waste under the definition of solid waste."
but it speaks to tires as a fuel and being combusted, e.g. cement kiln. At tire pyrolysis the tires are feedstock not fuel.

some EPA determinations for waste gas flare as a pollution control device say this isn't incinerator for AAAA
does flare have to meet general control device requirements in 40 cfr 60.18?

not incineration per EPA email 1/4/2017, Lisa Hanlon

10 CSR 10-6.260, Flare

	syngas production (lb/hr)	sulfur content wt%	MW sulfur	MW SO2	max syngas flowrate (cf/hr)	air : syngas ratio (mass)	exhaust mass (lb/hr)	exhaust scfm calculated	exhaust scfm applicant	SO2 PTE (lb/hr)	constant	SO2 ppmv	10 CSR 10-6.260 limit new units (ppmv)
max	[redacted]	1%	32.07	64.07	0	24	0	0	1100	0.00	1.558E-07	#DIV/0!	500
	[redacted]				3220		6600	1388	more	5.27		381	

exhaust density at 1100C (kg/m3)	exhaust density 1100C (lb/cf)	acf/hr	exhaust acfm
0.257	0.016	0	0
		411358	6856

propane exhaust density (kg/Nm3)	density at STP (lb/cf)	scf/hr	scfm
1.269	0.079	0	0
		83309	1388

flare exhaust is less than 500 ppmv so2, therefore in compliance
minimal so3 or H2SO4 expected

flare calculation reference:
enclosed flare test report, "Pollutant Emissions Test Report, Zink Enclosed Flare Exhaust" BFI Waste Systems of North America, LLC. Northville, Michigan. May 18 2016. Prepared by Air Quality Specialist, Inc.
http://www.deq.state.mi.us/aps/downloads/SRN/N2688/N2688_TEST_20160323.pdf
ppmv = lb/hr / (MW x dscfm x constant)

1200 btu/cf syngas per application, closer to natural gas HHV than landfill gas.
So natural gas stoichiometric combustion 10:1 by volume used instead of the Michigan landfill gas flare ratio of (7.383 exhaust scfm : LFG scfm)
however per email consultant Dan Martin 1/6/2017, air fuel ratio is 24:1

10 CSR 10-6.260, Pyrolysis Heater. Also applies to 10 CSR 10-6.261

max mmbtu/hr	syngas density (lb/cf)	HHV (btu/cf)	max syngas flowrate (cf/hr)	[redacted]	syngas sulfur content (wt%)	SO2 PTE (lb/hr)	lb SO2 / mmbtu	rule limit (lb SO2/mmbtu)
4.0	0.082	1200	3333.33	[redacted]	1%	5.46	1.37	8

heater is less than 8.0 lbs SO2 per mmbtu fuel input, therefore in compliance
10 CSR 10-6.261 applies to the flare, but there is no standard.

[redacted]rom temporary permit

Missouri Department of NATURAL RESOURCES
dnr.mo.gov
Eric R. Greitens, Governor
Carol S. Comer, Director

APR 28 2017

Mr. Nate Murphy
Vice President
Maryville Tire Solutions, LLC
1035 Pearl St, Ste 420
Boulder, CO 80302

RE: New Source Review Permit – Project Number: 2016-11-054

Dear Mr. Murphy:

Enclosed with this letter is your permit to construct. Please study it carefully and refer to Appendix A for a list of common abbreviations and acronyms used in the permit. Also, note the special conditions on the accompanying pages. The document entitled, "Review of Application for Authority to Construct," is part of the permit and should be kept with this permit in your files. Operation in accordance with these conditions, your new source review permit application and with your operating permit is necessary for continued compliance. The reverse side of your permit certificate has important information concerning standard permit conditions and your rights and obligations under the laws and regulations of the State of Missouri.

This permit may include requirements with which you may not be familiar. If you would like the department to meet with you to discuss how to understand and satisfy the requirements contained in this permit, an appointment referred to as a Compliance Assistance Visit (CAV) can be set up with you. To request a CAV, please contact your local regional office or fill out an online request. The regional office contact information can be found at the following website: http://dnr.mo.gov/regions/. The online CAV request can be found at http://dnr.mo.gov/cav/compliance.htm.

If you were adversely affected by this permit decision, you may be entitled to pursue an appeal before the administrative hearing commission pursuant to Sections 621.250 and 643.075.6 RSMo. To appeal, you must file a petition with the administrative hearing commission within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the administrative hearing commission, whose contact information is: Administrative Hearing Commission, United States Post Office Building, 131 West High Street, Third Floor, P.O. Box 1557, Jefferson City, Missouri 65102, phone: 573-751-2422, fax: 573-751-5018, website: www.oa.mo.gov/ahc.

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If you have any questions regarding this permit, please do not hesitate to contact David Little, at the Department of Natural Resources' Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102 or at (573) 751-4817. Thank you for your attention to this matter.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Susan Heckenkamp
New Source Review Unit Chief

SH:dlj

Enclosures

c: Kansas City Regional Office
PAMS File: 2016-11-054

Permit Number: 042017-014