November 24, 2020

Steve Murphy
General Manager
POET Biorefining – Laddonia, LLC
809 North Pine
Laddonia, MO 63352

RE: New Source Review Permit - Project Number: 2019-05-015

Dear Steve 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 submittal of an operating permit application 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 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 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.

If you have any questions regarding this permit, please do not hesitate to contact Alana Hess, 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:ahj

Enclosures

c: Northeast Regional Office
PAMS File: 2019-05-015

Permit Number: 112020-013

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: 112020-013 Project Number: 2019-05-015
Installation Number: 007-0054

Parent Company: POET Biorefining, LLC

Parent Company Address: 809 North Pine, Laddonia, MO 63352

Installation Name: POET Biorefining - Laddonia, LLC

Installation Address: 809 North Pine, Laddonia, MO 63352

Location Information: Audrain County, S36, T52N, R7W

Application for Authority to Construct was made for:
Modifications to increase ethanol production to 90,000,000 gallons per year. This review was conducted in accordance with Section (5) of 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.

Kendall B. Hale
Director or Designee
Department of Natural Resources

November 24, 2020
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/

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 to 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(3)(E). "Conditions required by permitting authority."

POET Biorefining – Laddonia, LLC
Audrain County, S36, T52N, R7W

1. Superseding Condition
The conditions of this permit supersede all of the special conditions found in Construction Permit 042019-015 previously issued by the Air Pollution Control Program.

2. Emission Limitations
A. POET Biorefining – Laddonia, LLC shall not discharge PM_{10} and $PM_{2.5}$ into the atmosphere in excess of the amounts listed in Table 1. These emission rates shall be verified through performance testing, as detailed in Special Condition 4.

Table 1: PM_{10} and $PM_{2.5}$ Emission Rate Limits[1]

Emission Source	Description	PM_{10} and $PM_{2.5}$ Control Devices	PM_{10} Emission Limits	$PM_{2.5}$ Emission Limits
EP01	Grain Receiving, Transfer, and Storage & DDGS Transfer	CE01 Baghouse	4.00E-1 lb/hr and 1.80E-3 gr/dscf	4.00E-1 lb/hr and 1.80E-3 gr/dscf
EP02	Grain Scalpers, Conveyor, and Surge Bin	CE02 Baghouse	6.00E-2 lb/hr and 3.68E-3 gr/dscf	1.09E-2 lb/hr and 1.16E-3 gr/dscf

[1] Some emission sources are not expected to produce condensables; therefore, their limits are filterable only. Other emissions sources are expected to produce both filterables and condensables. Special Condition 4 identifies which test methods should be employed. EPA Test Method 202 was required for condensable emission sources.

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

Emission Source	Description	PM_{10} and $PM_{2.5}$ Control Devices	PM_{10} Emission Limits	$PM_{2.5}$ Emission Limits
EP09	CE08A or CE08B Packed Bed Wet Scrubber, DDGS Fluid Bed Cooler, (2) DDGS Dryers, (7) Centrifuges, Whole Stillage Tank, Grain Oil System, and CE11 RTO	CE08A or CE08B Packed Bed Wet Scrubber, CE09 and CE10 Multiclones, and CE11 RTO	11.75 lb/hr and 3.38E-2 gr/dscf	11.75 lb/hr and 3.38E-2 gr/dscf
EP10	DDGS Fluid Bed Cooler	CE12 Baghouse	1.50 lb/hr and 7.02E-3 gr/dscf	1.50 lb/hr and 7.02E-3 gr/dscf
EP11	DDGS Silo	CE13 Baghouse	1.30E-1 lb/hr and 3.82E-3 gr/dscf	7.66E-2 lb/hr and 2.25E-3 gr/dscf
EP12	DDGS Silo Bypass	CE14 Baghouse	1.00E-1 lb/hr and 8.55E-3 gr/dscf	5.79E-2 lb/hr and 4.95E-3 gr/dscf
EP21	(6) Hammermills and Flour Conveyor	CE03, CE04, CE05, CE06, CE07, CE21, and CE22 Baghouses	1.14 lb/hr and 2.10E-3 gr/dscf	8.08E-1 lb/hr and 1.49E-3 gr/dscf

B. POET Biorefining – Laddonia, LLC shall not discharge NO_x into the atmosphere in excess of the amounts listed in Table 2. These emission rates shall be verified through performance testing, as detailed in Special Condition 4.

Table 2: NO_x Emission Rate Limits

Emission Source	Description	NO_x Control Device	NO_x Emission Limits
EP09	CE08A or CE08B Packed Bed Wet Scrubber, DDGS Fluid Bed Cooler, (2) DDGS Dryers, (7) Centrifuges, Whole Stillage Tank, Grain Oil System, and CE11 RTO	None	10.80 lb/hr and 7.15E-2 lb/MMBtu
EP13	Boiler #1	Low NO_x Burners	4.00 lb/hr and 4.00E-2 lb/MMBtu

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

Emission Source	Description	NO_x Control Device	NO_x Emission Limits
EP14	Boiler #2	Low NO_x Burners	4.00 lb/hr and 4.00E-2 lb/MMBtu

C. POET Biorefining – Laddonia, LLC shall not discharge Acrolein into the atmosphere in excess of the amounts listed in Table 3. These emission rates shall be verified through performance testing, as detailed in Special Condition 4.

Table 3: Acrolein Emission Rate Limits

Emission Source	Description	Acrolein Control Device	Acrolein Emission Limits
FERMVENT	Fermentation Process including: (8) 570,000 gallon fermentation tanks, (2) beer wells, a slurry tank, and (2) yeast propagation tanks.	Uncontrolled[2]	1.24E-1 lb/hr and 3.16E-7 lb/dscf
EP08	Distillation Process including: (6) evaporators, (2) beer strippers, a rectifier, a side stripper, a 200-proof rundown tank, reboilers, a regeneration tank, a 190-proof rundown tank, condenser, and (4) molecular sieve bottles.	CE08A or CE08B Packed Bed Wet Scrubber[3]	5.52E-2 lb/hr and 1.30E-7 lb/dscf
CENTVENT	(7) Centrifuges	Uncontrolled[4]	5.15E-3 lb/hr and 1.08E-7 lb/dscf
EP09	CE08A or CE08B Packed Bed Wet Scrubber, DDGS Fluid Bed Cooler, (2) DDGS Dryers, (7) Centrifuges, Whole Stillage Tank, Grain Oil System, and CE11 RTO	CE08A or CE08B Packed Bed Wet Scrubber, CE09 and CE10 Multiclones, and CE11 RTO	5.33E-2 lb/hr and 2.19E-8 lb/dscf

[2] This is an alternate operating scenario limited by Special Condition 6.A.1 to 20 hours per year.
[3] This is an alternate operating scenario limited by Special Condition 6.B.1 to 500 hours per year. The installation has two scrubbers, but only one will be used at a time.
[4] This is an alternate operating scenario limited by Special Condition 6.B.1 to 500 hours per year.

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

Emission Source	Description	Acrolein Control Device	Acrolein Emission Limits
EP10	DDGS Fluid Bed Cooler	Uncontrolled	7.81E-2 lb/hr and 3.10E-7 lb/dscf

D. POET Biorefining – Laddonia, LLC shall emit less than 2.16 tons of formaldehyde from the entire installation as listed in Table 4 in any consecutive 12-month period.

Table 4: Installation Formaldehyde Emission Source List

Emission Source	Description	Formaldehyde Control Device
EP01	Grain Receiving & DDGS Transfer[5]	None
FERMVENT	Fermentation and Distillation Processes	Uncontrolled[2]
EP08	Fermentation and Distillation Processes	CE08A or CE08B Packed Bed Wet Scrubber[3]
CENTVENT	(7) Centrifuges	Uncontrolled[4]
WHOLE	Whole Stillage Tank	Uncontrolled[4]
OIL	Grain Oil System	Uncontrolled[4]
EP09	CE08A or CE08B Packed Bed Wet Scrubber, DDGS Fluid Bed Cooler, (2) DDGS Dryers, (7) Centrifuges, Whole Stillage Tank, Grain Oil System, and CE11 RTO	CE08A or CE08B Packed Bed Wet Scrubber and CE11 RTO
EP10	DDGS Fluid Bed Cooler	Uncontrolled
EP11	DDGS Silo	None
EP12	DDGS Silo Bypass	None
EP13	Boiler #1	None
EP14	Boiler #2	None
TK07	Syrup Tank	None
FS03	Fermentation & Distillation Processes Equipment Leaks	LDAR[6]
FS05	Wet Cake Storage	None
FS06	DDGS Flat Storage	None
FS07	DDGS Loadout	None
FS08	Syrup & Grain Oil Loadout	None

E. Attachment A, or an equivalent form, such as an electronic form, approved by the Air Pollution Control Program shall be used to demonstrate compliance with Special Condition 2.D. The equivalent form shall use the

[5] Grain receiving is not a formaldehyde emission source. DDGS transfer is a formaldehyde emission source.
[6] Required by NSPS VVa.

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

same emission factors and calculation methods as indicated in Attachment A.

3. Operational Limitations

A. POET Biorefining – Laddonia, LLC shall post and maintain a sign limiting the speed on their haul roads to 10 mph.

B. POET Biorefining – Laddonia, LLC shall not receive/handle material in excess of the values in Table 5.

Table 5: Raw Material Receiving/Handling Limitations

Raw Material	Daily Limit	12-Month Rolling Total Limit
Grain	9,000 tons	884,211 tons
Denaturant	N/A	4,736,900 gallons
Chemicals	N/A	365 trucks

C. POET Biorefining – Laddonia, LLC shall not produce/ship material in excess of the values in Table 6.

Table 6: Production/Shipping Limitations

Product	12-Month Rolling Total Limit
DDGS	230,000 tons
Wet cake	150,000 tons
200 proof and 190 proof Ethanol	90,000,000 gallons combined
Grain Oil	15,778 tons
Liquid CO_2	75,000 tons
Syrup	4,800,000 gallons

D. POET Biorefining – Laddonia, LLC shall not receive grain between the hours of 9 PM and 5 AM each day.

E. POET Biorefining – Laddonia, LLC shall not loadout DDGS between the hours of 9 PM and 5 AM each day.

F. POET Biorefining – Laddonia, LLC shall not transfer DDGS in excess of 46,000 tons to EP12 DDGS Silo Bypass and FS06 DDGS Flat Storage in any consecutive 12-month period.

G. POET Biorefining – Laddonia, LLC shall only loadout denatured, 200-proof, and 190-proof ethanol into railcars that are in dedicated normal denatured ethanol service.

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

H. POET Biorefining – Laddonia, LLC shall exclusively use denaturant which meets the definitions of *natural gasoline*[7] at 27 CFR 21.118-T3, *gasoline*[8] at 27 CFR 21.109, or *gasoline, unleaded*[8] at 27 CFR 21.110.

I. POET Biorefining – Laddonia, LLC is currently not equipped to continuously measure DDGS production; therefore, DDGS production shall be estimated by taking the continuously measured beer feed rate (gph) and multiplying by current six-month average beer feed (gallons) to DDGS production (tons) ratio.

J. POET Biorefining – Laddonia, LLC shall develop forms to demonstrate compliance with Special Conditions 3.B and 3.C. The forms shall contain, at a minimum, the following information:
1) Installation name
2) Installation ID
3) Permit number
4) Date (MM:DD:YYYY)
5) The time (HH:MM) of each grain delivery
6) Daily, monthly, and 12-month rolling total grain received (tons)
7) Monthly and 12-month rolling total denaturant received (gallons)
8) Monthly and 12-month rolling total number of chemical trucks received (# of trucks)
9) The time (HH:MM) of each DDGS shipment
10) Monthly and 12-month rolling total beer fed (gallons)
11) Six-month rolling average beer feed (gallons) to DDGS production (tons) ratio.
12) Monthly and 12-month rolling total DDGS production (tons)
13) Monthly and 12-month rolling total wet cake production (tons)
14) Monthly and 12-month rolling total 200-proof and 190-proof combined ethanol production (gallons)
15) Monthly and 12-month rolling total grain oil production (tons)
16) Monthly and 12-month rolling total liquid CO_2 shipping (gallons)
17) Monthly and 12-month rolling total syrup production (gallons)
18) Monthly and 12-month rolling total DDGS transferred to EP12 and FS06 (tons)

K. POET Biorefining – Laddonia, LLC shall maintain records from their denaturant supplier to demonstrate compliance with Special Condition 3.H.

[7] With maximum liquid HAP contents (wt%) of 3.20% hexane, 0.39% benzene, 0.47% toluene, 0.02% ethylbenzene, and 0.18% xylene.
[8] With maximum liquid HAP contents (wt%) of 7% hexane, 2.3% benzene, 15% toluene, 2% ethylbenzene, 15% xylene, 10% cumene, 1% naphthalene, 2.94% 2,2,4-trimethylpentane, 0.001% 1,3-butadiene, 0.08% styrene, and no other HAPs.

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

4. Performance Testing
   A. EP01 Grain Receiving, Transfer, and Storage & DDGS Transfer
      a. POET Biorefining – Laddonia, LLC shall conduct performance tests to demonstrate compliance with the filterable PM_{10} and filterable $PM_{2.5}$ limits in Table 1 (Special Condition 2.A).
      b. Testing shall be conducted by no later than 180 days after whichever of the following occurs first:
         i. The initial startup of the 5th hammermill for commercial operation or
         ii. Grain receiving exceeds an average of 171 tph during any three-hour period.
      c. Testing shall be conducted using EPA Test Method 201A or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
      d. EP01 shall be limited to 110% of the three-hour average grain receiving rate (tph) observed during the stack test required by this permit condition.
      e. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
         i. The grain receiving rate (tph)
         ii. The type of grain (i.e. corn, sorghum, wheat, etc.)
         iii. The number of straight trucks
         iv. The number of hopper trucks
         v. The differential pressure across CE01 Baghouse
         vi. The MERV rating of the filter(s) in CE01 Baghouse

   B. EP02 Grain Scalpers, Conveyor, and Surge Bin
      a. POET Biorefining – Laddonia, LLC shall conduct performance tests to demonstrate compliance with the filterable PM_{10} and filterable $PM_{2.5}$ limits in Table 1 (Special Condition 2.A).
      b. Testing shall be conducted by no later than 180 days after whichever of the following occurs first:
         i. The initial startup of the 5th hammermill for commercial operation or
         ii. Grain handling exceeds average of 81 tph during any three-hour period.
      c. Testing shall be conducted using EPA Test Method 201A or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
      d. EP02 shall be limited to 110% of the three-hour average grain handling rate (tph) observed during the stack test required by this permit condition.
      e. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
         i. The grain handling rate (tph)

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

ii. The type of grain (i.e. corn, sorghum, wheat, etc.)
iii. The differential pressure across CE02 Baghouse
iv. The MERV rating of the filter(s) in CE02 Baghouse

C. Fermentation and Distillation Processes (EP08 and FERMVENT)
   a. POET Biorefining – Laddonia, LLC shall conduct performance tests to demonstrate compliance with the acrolein limits in Table 3 (Special Condition 2.C), to verify that no primary PM_{10} emissions are detectable from the fermentation and distillation processes during the three one-hour test runs, and to verify that the VOC, acetaldehyde, methanol, and formaldehyde emission factors[9] from prior to the expansion remain applicable. If stack testing indicates any of the following, POET Biorefining – Laddonia, LLC shall submit a construction permit application no later than 90 days after the submittal of the test results to true-up emissions:
      i. Primary PM_{10} emissions are detected from the FERMVENT or EP08
      ii. VOC emissions exceed 8.82E-1 lb/kgal beer from EP08.
      iii. Acetaldehyde emissions exceed 9.65E-2 lb/kgal beer from EP08.
      iv. Formaldehyde emissions exceed 3.33E-4 lb/kgal beer from EP08.
      v. Methanol emissions exceed 2.97E-3 lb/kgal beer from EP08.
      vi. Acrolein emissions exceed 9.20E-4 lb/kgal beer from EP08.
      vii. VOC emissions exceed 20.29 lb/kgal beer from FERMVENT.
      viii. Acetaldehyde emissions exceed 9.02E-2 lb/kgal from FERMVENT.
      ix. Formaldehyde emissions exceed 5.29E-4 lb/kgal from FERMVENT.
      x. Methanol emissions exceed 7.82E-3 lb/kgal from FERMVENT.
      xi. Acrolein emissions exceed 2.07E-3 lb/kgal from FERMVENT.
   b. Testing shall be conducted during the summer[10] of 2021.
   c. VOC, acetaldehyde, acrolein, methanol, and formaldehyde testing shall be conducted using EPA Test Methods 320 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
   d. Primary PM_{10} and primary $PM_{2.5}$ testing shall be conducted using EPA Test Methods 201A and 202 or other methods as approved by the Air Pollution Control Program.

[9] EP08 emission factors: 8.82E-1 lb VOC/kgal beer, 9.65E-2 lb acetaldehyde/kgal beer, 3.33E-4 lb formaldehyde/kgal beer, 2.97E-3 lb methanol/kgal beer, 1.95E-3 lb acrolein/kgal beer.
[10] June, July, or August. Information from other states indicates that high summer temperatures represent the worst-case VOC emissions scenario.

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

e. EP08 shall be limited to 110% of the average beer processing rate (gpm on a three-hour average basis) during the stack test.
f. FERMVENT shall be limited to 110% of the average beer processing rate (gpm on a three-hour average basis) during the stack test.
g. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
    i. That no fermentation and distillation process emissions are being vented to the RTO
    ii. The enzyme being used
    iii. The yeast being used
    iv. If CE08A or CE08B Packed Bed Wet Scrubber were in operation (i.e. controlled (EP08) or uncontrolled (FERMVENT) operating scenario)
    v. The beer processing rate (gpm)
    vi. For the controlled (EP08) operating scenario runs:
        1. The total scrubbing liquid flow rate through CE08A and CE08B Packed Bed Wet Scrubbers
        2. The scrubbing agent flow rate through CE08A and CE08B Packed Bed Wet Scrubbers
        3. The scrubbing agent used
        4. The differential pressure across CE08A and CE08B Packed Bed Wet Scrubbers

D. CENTVENT (7) Centrifuges
a. POET Biorefining – Laddonia, LLC shall conduct performance tests to verify that no primary PM_{10} emissions are detectable from the centrifuges during the three one-hour test runs, to demonstrate compliance with the acrolein limits in Table 3 (Special Condition 2.C), and to verify that the VOC, acetaldehyde, methanol, and formaldehyde emission factors from prior to the expansion remain applicable. If stack testing indicates any of the following, POET Biorefining – Laddonia, LLC shall submit a construction permit application no later than 90 days after the submittal of the test results to true-up emissions:
    i. Primary PM_{10} emissions are detected.
    ii. VOC emissions exceed 3.25E-2 lb/kgal beer.
    iii. Acetaldehyde emissions exceed 4.59E-4 lb/kgal beer.
    iv. Formaldehyde emissions exceed 5.55E-6 lb/kgal beer.
    v. Methanol emissions exceed 3.09E-4 lb/kgal beer.
    vi. Acrolein emissions exceed 8.58E-5 lb/kgal beer.
b. Testing shall be conducted during the summer[10] of 2021.
c. Primary PM_{10} and primary $PM_{2.5}$ testing shall be conducted using EPA Test Methods 201A and 202 or other methods as approved by

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

the Air Pollution Control Program's Stack Testing Unit. All of the measured PM shall be assumed to be PM_{10}.

d. VOC, acetaldehyde, acrolein, methanol, and formaldehyde testing shall be conducted using EPA Test Methods 320 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
e. CENTVENT shall be limited to 110% of the beer processing rate (gpm on a three-hour average basis) during the stack test.
f. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
    i. The enzyme being used
    ii. The yeast being used
    iii. The beer processing rate (gpm)
    iv. The wet cake production rate (tph)
    v. That no centrifuge emissions are being vented to the RTO

E. EP09 CE08A or CE08B Packed Bed Wet Scrubber, DDGS Fluid Bed Cooler, (2) DDGS Dryers, (7) Centrifuges, Whole Stillage Tank, Grain Oil System, and CE11 RTO
    a. POET Biorefining – Laddonia, LLC shall conduct performance tests to demonstrate compliance with the primary PM_{10} and primary $PM_{2.5}$ limits in Table 1 (Special Condition 2.A), the NO_x limits in Table 2 (Special Condition 2.B), and the acrolein limits in Table 3 (Special Condition 2.C) and to verify that the CO, VOC, acetaldehyde, methanol, and formaldehyde emission factors from prior to the expansion remain applicable. If stack testing indicates any of the following, POET Biorefining – Laddonia, LLC shall submit a construction permit application no later than 90 days after the submittal of the test results to true-up emissions:
        i. VOC emissions exceed 6.63E-2 lb/kgal beer.
        ii. Acetaldehyde emissions exceed 5.08E-3 lb/kgal beer.
        iii. Formaldehyde emissions exceed 3.64E-3 lb/kgal beer.
        iv. Methanol emissions exceed 4.00E-3 lb/kgal beer.
        v. Acrolein emissions exceed 8.88E-4 lb/kgal beer.
        vi. NO_x emissions exceed 1.80E-1 lb/kgal beer.
        vii. CO emissions exceed 1.90E-1 lb/kgal beer.
        viii. Primary PM_{10} exceed 1.96E-1 lb/kgal beer.
        ix. Primary $PM_{2.5}$ exceed 1.96E-1 lb/kgal beer.
    b. Testing shall be conducted during the summer[10] of 2021 and once every five years thereafter.
    c. Primary PM_{10} and primary $PM_{2.5}$ testing shall be conducted using EPA Test Methods 5 and 202 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit. All of the measured PM shall be assumed to be $PM_{2.5}$.

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

d. NO_X testing shall be conducted using EPA Test Method 7E or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
e. VOC, acetaldehyde, acrolein, methanol, and formaldehyde testing shall be conducted using EPA Test Methods 320 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
f. CO testing shall be conducted using EPA Test Method 10B or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
g. EP09 shall be limited to 110% of the average beer processing rate (gpm on a three-hour average basis) during the most recent stack test.
h. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
    i. The enzyme being used
    ii. The yeast being used
    iii. That no emissions are venting out of EP08, FERMVENT, or CENTVENT
    iv. That the exhaust from the DDGS Fluid Bed Cooler is being vented to DDGS Dryers as combustion air
    v. The emissions from the whole stillage tank and grain oil system are venting to the RTO
    vi. The volumetric exhaust flow rate (dcfm) out of EP10
    vii. The beer processing rate (gpm)
    viii. The estimated DDGS production rate (tph) based on the beer processing rate (gpm) and the current six-month beer to DDGS production ratio.
    ix. That no wetcake is being produced
    x. The differential pressure across CE09 and CD10 Multiclones
    xi. The total scrubbing liquid flow rate through CE08A and CE08B Packed Bed Wet Scrubbers
    xii. The scrubbing agent flow rate through CE08A and CE08B Packed Bed Wet Scrubbers
    xiii. The scrubbing agent used
    xiv. The differential pressure across CE08A and CE08B Packed Bed Wet Scrubbers
    xv. The combustion chamber temperature of CE11 RTO
    xvi. The natural gas combustion rate of the (2) DDGS Dryers and CE11 RTO (MMBtu/hr)

F. EP10 DDGS Fluid Bed Cooler
a. POET Biorefining – Laddonia, LLC shall conduct performance tests to demonstrate compliance with the primary PM_{10} and primary $PM_{2.5}$ limits in Table 1 (Special Condition 2.A) and with the acrolein

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

limits in Table 3 (Special Condition 2.C), to establish the normal air flow rate after the DDGS production increase, and to verify that the VOC, acetaldehyde, acrolein, methanol, and formaldehyde emission factors from prior to the expansion remain applicable. If stack testing indicates any of the following, POET Biorefining – Laddonia, LLC shall submit a construction permit application no later than 90 days after the submittal of the test results to true-up emissions:

i. The observed flow rate from EP10 exceeds 7,000 dscfm.
ii. VOC emissions exceed 7.26E-2 lb/ton DDGS.
iii. Acetaldehyde emissions exceed 1.40E-3 lb/ton DDGS.
iv. Formaldehyde emissions exceed 5.47E-4 lb/ton DDGS.
v. Methanol emissions exceed 7.57E-4 lb/ton DDGS.
vi. Acrolein emissions exceed 4.32E-4 lb/ton DDGS.

b. Testing shall be conducted during the summer[10] of 2021.
c. Primary PM_{10} and primary $PM_{2.5}$ testing shall be conducted using EPA Test Methods 201A and 202 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
d. VOC, acetaldehyde, acrolein, methanol, and formaldehyde testing shall be conducted using EPA Test Methods 320 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
e. EP10 shall be limited to 110% of the three-hour average DDGS production rate (tph) during the stack test.
f. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
   i. The enzyme being used
   ii. The yeast being used
   iii. The beer processing rate (gpm)
   iv. The estimated DDGS production rate (tph) based on the current six-month beer to DDGS production ratio.
   v. The differential pressure across CE12 Baghouse
   vi. The MERV rating of the filter(s) in CE12 Baghouse
   vii. The volumetric exhaust flow rate from EP10 (dscfm)

G. EP11 DDGS Silo

a. POET Biorefining – Laddonia, LLC shall conduct performance tests on EP11 DDGS Silo to demonstrate compliance with the primary PM_{10} and primary $PM_{2.5}$ limits in Table 1 (Special Condition 2.A) and to establish site-specific VOC, acetaldehyde, methanol, and formaldehyde emission factors. The valve shall be positioned such that all of the DDGS is being transferred to the silo being tested.
b. Testing shall be conducted by no later than 180 days after the DDGS transfer rate to EP11 exceeds an average of 21 tph during any three-hour period.

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

c. Primary PM_{10} and primary $PM_{2.5}$ testing shall be conducted using EPA Test Methods 201A and 202 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
d. VOC, acetaldehyde, methanol, and formaldehyde testing shall be conducted using EPA Test Methods 320 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
e. EP11 shall be limited to 110% of the three-hour average DDGS transfer rate (tph) during the stack test.
f. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
    i. The enzyme being used
    ii. The yeast being used
    iii. The beer processing rate (gpm)
    iv. That no wetcake is being produced.
    v. That EP12 is not in operation.
    vi. The estimated DDGS transfer rate (tph) to EP11 based on the current six-month beer to DDGS production ratio.
    vii. The differential pressure across CE13 Baghouse
    viii. The MERV rating of the filter(s) in CE13 Baghouse

H. EP12 DDGS Silo Bypass
a. VOC, acetaldehyde, formaldehyde, and methanol performance testing conducted on EP11 shall be considered representative of EP12 and used to demonstrate compliance with the formaldehyde tracking in Attachment A.
b. POET Biorefining – Laddonia, LLC shall conduct performance tests to demonstrate compliance with the primary PM_{10} and primary $PM_{2.5}$ limits in Table 1 (Special Condition 2.A).
c. Testing shall be conducted by no later than 180 days after the DDGS transfer rate to EP12 exceeds an average of 21 tph during any three-hour period.
d. Testing shall be conducted using EPA Test Methods 201A and 202 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
e. EP12 shall be limited to 110% of the three-hour average DDGS transfer rate (tph) during the stack test.
f. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
    i. The beer processing rate (gpm)
    ii. That no wetcake is being produced.
    iii. That EP11 is not in operation.
    iv. The estimated DDGS transfer rate to EP12 (tph) based on the current six-month beer to DDGS production ratio.
    v. The differential pressure across CE14 Baghouse
    vi. The MERV rating of the filter(s) in CE14 Baghouse

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

I. EP13 Boiler #1 and EP14 Boiler #2
   a. POET Biorefining – Laddonia, LLC shall conduct performance tests on one of the boilers[11] to demonstrate compliance with the NO_x limits in Table 2 (Special Condition 2.B) and to verify that the CO emission factors in Attachment B are representative.
   b. Testing shall be conducted by whichever of the following occurs first:
      i. May 2021 or
      ii. Heat input to either of the boilers exceeds an average of 76 MMBtu/hr during any three-hour period.
   c. NO_x testing shall be conducted using EPA Test Method 7E or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
   d. CO testing shall be conducted using EPA Test Method 10B or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
   e. EP13 and EP14 shall be limited to 110% of the three-hour average natural gas combustion rate (MMBtu/hr) during the stack test.
   f. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
      i. The natural gas combustion rate (MMBtu/hr) of EP13 or EP14, whichever is being tested

J. EP21 (6) Hammermills and Flour Conveyor
   a. POET Biorefining – Laddonia, LLC shall conduct performance tests to demonstrate compliance with the primary PM_{10} and primary $PM_{2.5}$ limits in Table 1 (Special Condition 2.A).
   b. Testing shall be conducted by no later than 180 days after the initial startup of the new stack, EP21, for commercial operation.
   c. Testing shall be conducted using EPA Test Methods 201A and 202 or other methods as approved by the Air Pollution Control Program's Stack Testing Unit.
   d. EP21 shall be limited to 110% of the three-hour average grain processing rate (tph) during the stack test.
   e. During each run of the testing event, POET Biorefining – Laddonia, LLC shall document:
      i. The grain processing rate (tph)
      ii. The differential pressure across CE03, CE04, CE05, CE06, CE07, CE21, and CE22 Baghouses
      iii. The MERV rating of the filter(s) in CE03, CE04, CE05, CE06, CE07, CE21, and CE22 Baghouses

[11] These boilers are identical units; therefore, stack testing of one boiler is considered representative of the other boiler.

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

K. If the performance testing required by Special Condition 4 indicates that any of the emission limits specified in Special Conditions 2.A, 2.B, and 2.C are being exceeded, POET Biorefining – Laddonia, LLC shall either:
   a. Propose a compliance plan to the Air Pollution Control Program within 30 days of submitting the performance test results. The compliance plan shall demonstrate how the installation will reduce the emission rates below those stated in Special Conditions 2.A, 2.B, and 2.C. POET Biorefining – Laddonia, LLC shall implement any such plan immediately upon its approval by the Director and testing shall be performed within 90 days after compliance plan implementation to ensure that the proposed measures are sufficient to achieve compliance with the emission limits in Special Conditions 2.A, 2.B, and 2.C. ***or***
   b. Submit a construction permit amendment application to the Air Pollution Control Program within 60 days of submitting the performance test results. The application shall include ambient air quality modeling demonstrating that the installation does not violate the NAAQS and the RALs at the higher emission rate(s).

5. Proposed Test Plan

A. For testing required in Special Condition 4, completed Proposed Test Plan Forms must be submitted to the Air Pollution Control Program 30 days prior to the proposed test dates so that the Air Pollution Control Program may arrange pretest meetings, if necessary, and assure that the test dates is acceptable for an observer to be present. The Proposed Test Plans may serve the purpose of notification and must be approved by the Director prior to conducting the required emission testing.

B. One electronic copy of a written report of the performance test results shall be submitted to the Director 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 US EPA method for at least one sample run.

C. The test report is to fully account for all operational and emission parameters addressed both in the permit conditions as well as in any other applicable state or federal rules or regulations.

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

6. Control Device Requirements – Packed Bed Wet Scrubbers and RTO
   A. POET Biorefining – Laddonia, LLC shall control emissions from the fermentation process[12] and distillation process[13] using either CE08A or CE08B Packed Bed Wet Scrubbers at all times, except:
      1) POET Biorefining – Laddonia, LLC may bypass CE08A and CE08B Packed Bed Wet Scrubbers for a combined maximum of 20 hours in any consecutive 12-month period.

   B. POET Biorefining – Laddonia, LLC shall control emissions from CE08A and CE08B Packed Bed Wet Scrubbers, (7) Centrifuges, the Whole Stillage Tank, and the Grain Oil System using CE11 RTO at all times, except:
      1) POET Biorefining – Laddonia, LLC may bypass CE11 RTO for a maximum of 500 hours in any consecutive 12-month period.

   C. POET Biorefining – Laddonia, LLC shall limit the exhaust flow from EP10 stack to less than or equal to 7,000 dscm, with the remainder of the exhaust flow from the DDGS Fluid Bed Cooler being routed to the DDGS Dryers' at all times, except:
      1) POET Biorefining – Laddonia, LLC may vent more than 7,000 dscfm of exhaust flow from the DDGS Fluid Bed Cooler to atmosphere out of EP10 for a maximum of 200 hours in any consecutive 12-month period.

      2) POET Biorefining – Laddonia shall install an air flow meter on EP10.

      3) POET Biorefining – Laddonia shall monitor and record the air flow from EP10 at least once per hour. Any flow meter readings greater than 7,000 dscfm shall be counted towards the 200 hour limit.

   D. POET Biorefining – Laddonia, LLC shall control emissions from the (2) DDGS Dryers at all times using CE11 RTO, with no exceptions.

   E. The packed bed wet scrubbers and any related instrumentation or equipment shall be operated and maintained in accordance with the manufacturer's specifications. Each scrubber shall be equipped with a gauge or meter that indicates the air pressure drop across the scrubber. Each scrubber shall be equipped with an air flow meter that indicates the flow through the scrubber. These gauges and meters shall be located in such a way they may be easily observed by Department of Natural Resources' personnel.

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[12] (8) 570,000 gallon fermentation tanks, (2) beer wells, a slurry tank, and (2) yeast propagation tanks.
[13] (6) evaporators, (2) beer strippers, a rectifier, a side stripper, a 200-proof rundown tank, reboilers, a regeneration tank, a 190-proof rundown tank, condenser, and (4) molecular sieve bottles.

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

F. POET Biorefining – Laddonia, LLC shall monitor and record the differential pressure across whichever scrubber is being used to control emissions and the air flow rate through whichever scrubber is being used to control emissions. The differential pressure and the air flow rate shall be recorded at least once every 24 hours while the fermentation and distillation process are in operation. The differential pressure shall be maintained within the normal operating range specified by the scrubber manufacturer.

G. POET Biorefining – Laddonia, LLC shall monitor and record the liquid flow rate through whichever scrubber is being used to control emissions at least once every 15 minutes. The liquid flow rate shall be maintained at a value greater than or equal to the average liquid flow rate recorded during the most recent performance test, which demonstrated compliance with all applicable emission limits. The most recent 60 months of records shall be maintained on-site and shall be made available to Missouri Department of Natural Resources' personnel upon request. The scrubbing agent shall be water.

H. The combustion chamber temperature of the RTO shall be continuously monitored and recorded while the DDGS Dryers are in operation. The operating temperature of the RTO shall be maintained on a rolling three-hour average at a temperature greater than 50°F below the average combustion chamber temperature recorded during the most recent performance test, which demonstrated compliance with all applicable emission limits. The most recent 60 months of records shall be maintained on-site and shall be made available to Missouri Department of Natural Resources' personnel upon request.

I. POET Biorefining – Laddonia, LLC shall document all time periods during which exhaust gases from the DDGS Fluid Bed Cooler are venting to atmosphere out of EP10. All of these time periods shall be counted towards the exception in Special Condition 6.C.1.

J. POET Biorefining – Laddonia, LLC shall develop forms to demonstrate compliance with Special Conditions 6.A.1, 6.B.1, and 6.C.1. The forms shall contain, at a minimum, the following information:
1) Installation name
2) Installation ID
3) Permit number
4) Date (MM:YYYY)
5) Monthly and 12-month rolling total hours of CE08A and CE08B Packed Bed Wet Scrubbers bypass
6) Monthly and 12-month rolling total hours of CE11 RTO bypass

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

7) Monthly and 12-month rolling total hours of exhaust flow from EP10 exceeding 7,000 dscfm

K. POET Biorefining – Laddonia, LLC shall maintain an operating and maintenance log for the packed bed wet scrubbers and the RTO, which shall include the following:
1) Incidents of malfunction, with impact on emissions, duration of events, probable cause, and corrective actions; and
2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc; and
3) A written record of regular inspection schedule, the date and results of all inspection including any actions or maintenance activities that results from that inspection.

7. Increment
If an increment evaluation for this area should reveal a violation(s) of increment in the immediate area of the installation and if it is further demonstrated that the installation is either the cause or is contributing to the violation(s), the Director may require the permittee to submit a corrective action plan to address the violation(s) or the portion of the violation(s) that is caused by the installation. This corrective action plan, if requested, shall be submitted within 30 days and shall be adequate to timely and significantly mitigate the emissions of PM_{10} and $PM_{2.5}$ to address the situation causing the violation(s). POET Biorefining – Laddonia, LLC shall implement any such corrective action plan immediately upon its approval by the Director. Failure to either submit or implement such a plan shall be a violation of this permit.

8. Modeling Analysis Restrictions
A. POET Biorefining – Laddonia, LLC shall notify the Air Pollution Control Program before initial startup of any modifications to the facility design that could impact the release parameters for acrolein and PM_{10} specified in the Memorandum "Ambient Air Quality Impact Analysis (AAQIA) for POET Biorefining – Laddonia, LLC – November Revision" (November 2019) from the Modeling Unit.

B. POET Biorefining – Laddonia, LLC shall notify the Air Pollution Control Program before initial startup of any modifications to the facility design that could impact the release parameters for $PM_{2.5}$ specified in the Memorandum "Ambient Air Quality Impact Analysis (AAQIA) for POET Biorefining – Laddonia, LLC – August Revision" (August 2020) from the Modeling Unit.

C. In the event the Air Pollution Control Program determines that the changes are significant, POET Biorefining – Laddonia, LLC shall submit an updated AAQIA to the Air Pollution Control Program that continues to

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

demonstrate compliance with the PM_{10} NAAQS, $PM_{2.5}$ NAAQS, and Missouri's Acrolein RAL.

9. Control Device Requirement – Baghouses

A. POET Biorefining – Laddonia, LLC shall control emissions from the emission sources listed in Table 9 using baghouses as specified in the permit application.

Table 7: Equipment Controlled by Baghouses

Emission Source	Description	Control Device
EP01	Grain Receiving, Transfer, and Storage & DDGS Transfer	CE01 Baghouse
EP02	Grain scalpers, Conveyor, and Surge Bin	CE02 Baghouse
EP10	DDGS Fluid Bed Cooler	CE12 Baghouse
EP11	DDGS Silo	CE13 Baghouse
EP12	DDGS Silo Bypass	CE14 Baghouse
EP21	Hammermill #1	CE03 Baghouse
	Hammermill #2	CE04 Baghouse
	Hammermill #3	CE05 Baghouse
	Hammermill #4	CE06 Baghouse
	Hammermill #5	CE21 Baghouse
	Hammermill #6	CE22 Baghouse
	Flour Conveyor	CE07 Baghouse

B. The baghouses and any related instrumentation or equipment shall be operated and maintained in accordance with the manufacturer's specifications.

C. POET Biorefining – Laddonia, LLC shall measure the differential pressure across each baghouse by installing static pressure gauges at the inlet and the outlet of each baghouse. The differential pressure shall be the difference between the two static pressure gauges. These gauges shall be located such that Department of Natural Resources' employees may easily observe them.

D. Replacement filters for the baghouses 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). Replacement filters shall have the same or higher MERV rating than those currently in use.

E. POET Biorefining – Laddonia, LLC shall monitor the differential pressure across each baghouse at least once every 24 hours. The differential pressure shall be maintained within the design conditions specified by the

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

manufacturer. A differential pressure outside of the manufacturer's design conditions indicates a malfunction.

F. POET Biorefining – Laddonia, LLC shall maintain a copy of the baghouse manufacturer's specifications on site.

G. POET Biorefining – Laddonia, LLC shall maintain an operating and maintenance log for the baghouses which shall include the following:
1) Daily pressure drop readings;
2) Daily visible emission observation results;
3) The MERV rating of the current filters;
4) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
5) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.

H. Baghouse malfunctions shall be corrected as soon as practicable. If the malfunction cannot be corrected within eight hours of detection, POET Biorefining – Laddonia, LLC shall cease operation of the emission source until the baghouse is restored to proper operation.

I. Performance testing shall be conducted in accordance with Special Condition 4 to demonstrate that the emission sources are in compliance with the PM_{10} emission limitations in Special Condition 2.A while the baghouses are properly maintained and operated.

10. Control Equipment – Flare
A. The flare must be in use at all times during denatured, 200-proof, and 190-proof ethanol truck loadout (EP15), except:
1) POET Biorefining – Laddonia, LLC may bypass the flare for a maximum of 2,000,000 gallons of denatured, 200-proof, and 190-proof ethanol combined in any consecutive 12-month period. This exception only applies when blending natural gasoline as the denaturant.

B. POET Biorefining – Laddonia, LLC shall develop forms to demonstrate compliance with Special Condition 10.A.1. The forms shall contain, at a minimum, the following information:
1) Installation name
2) Installation ID
3) Permit number
4) Date (MM:YYYY)
5) Monthly and 12-month rolling total gallons of denatured, 200-proof, and 190-proof ethanol combined loaded out by truck without flare control

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

6) Identification of denaturant being blended

C. POET Biorefining – Laddonia, LLC shall maintain an operating and maintenance log for the flare 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) A written record of regular inspection schedule, the date and results of all inspections including any actions or maintenance activities that result from that inspection.
4) A written record of the total number of hours the flare is bypassed, including the date and time of the bypass.

11. Haul Road Requirements
A. POET Biorefining – Laddonia, LLC shall pave all of the haul roads (FS02) at the installation with materials such as asphalt, concrete, and/or other material(s) after receiving approval from the Air Pollution Control Program.

B. Maintenance and/or repair of the surfaces will be conducted as necessary to ensure that the physical integrity of the pavement.

C. The silt loading of the haul roads shall not exceed 0.4 g/m^2.

D. Compliance with Special Condition 11.C shall be demonstrated by conducting silt loading sampling (as defined in Appendix C.1 and C.2 of AP-42).
1) Silt loading sampling shall be conducted using a vacuum equipped with HEPA filtration.
2) Each sample area shall be large enough to obtain 100 grams of material.
3) Sampling shall not be conducted within one week following any undocumented haul road watering or undocumented chemical dust suppression application.
4) Sampling shall not be conducted within the 24 hours following any day in which 0.01 inches or more of precipitation fell at the installation.

E. Analysis of the samples shall be conducted in accordance with ASTM C 135 method. The silt calculation shall add all of the mass retained in the vacuum bag to the mass passing the #200 sieve.

F. POET – Laddonia shall denote all precipitation amounts within the week prior to any silt testing event.

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

G. Testing shall be conducted once per calendar quarter for the first four full calendar quarters following the issuance of this permit and annually during the harvest season thereafter. Testing may be suspended if three consecutive annual tests document silt loadings below 75% of the standard.

H. Silt loading test results shall be maintained onsite and shall be provided to Department of Natural Resources' personnel upon request.

I. No later than 90 days after two consecutive tests document an exceedance of the silt loading limitation, POET Biorefining – Laddonia, LLC shall submit an application to amend this permit. The application shall include revised haul road emission calculations and revised PM_{10} and $PM_{2.5}$ modeling based on the observed site-specific silt loading values.

12. Cooling Tower Requirements

A. The cooling tower shall be equipped with high efficiency drift eliminators that are designed to reduce drift loss to less than 0.005%.

B. POET Biorefining – Laddonia, LLC shall demonstrate compliance with Special Condition 12.A by maintaining documentation from the drift eliminator manufacturer indicating the maximum design drift loss.

C. The cooling tower and high efficiency drift eliminators shall be operated and maintained in accordance with the manufacturer's specifications. A copy of the manufacturer's specifications shall be retained onsite.

D. The cooling water circulation rate shall not exceed 27,900 gpm. Any increase to the pumping capacity shall first be approved by the Air Pollution Control Program's Construction Permits Unit.

E. POET Biorefining – Laddonia, LLC shall demonstrate compliance with Special Condition 12.D by maintaining documentation from the manufacturer of the maximum cooling water circulation rate.

F. The total dissolved solids (TDS) content in the circulating cooling water shall not exceed 1,500 ppm. TDS samples shall be collected and analyzed according to the following schedule:

1) Quarterly for the first four full calendar quarters after the start-up of the 8th fermentation tank and
2) Annually thereafter.

Testing may be suspended if three consecutive annual tests document TDS contents below 75% of the standard.

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

G. No later than 90 days after two consecutive TDS samples exceed 1,500 ppm, POET Biorefining – Laddonia, LLC shall submit an application to amend this permit. The application shall include revised cooling tower emission calculations and revised PM_{10} and $PM_{2.5}$ modeling based on the observed site-specific TDS content.

13. Capture Requirements

A. POET Biorefining – Laddonia, LLC shall equip each receiving/shipping bay entrance and exit with retractable doors. The entrance doors shall be closed at all grain times, with the exception of when a railcar/train engine is actively blocking the entrance door or a truck/railcar is actively entering the bay. Exit doors shall be closed when the wind speed exceeds 20 mph, with the exception of when a railcar/train engine is actively blocking the exit door or a truck/railcar is actively exiting the bay.

B. POET Biorefining – Laddonia, LLC shall ensure that choke flow occurs during all grain receiving events.

1) POET Biorefining – Laddonia, LLC shall monitor and record the presence of choke flow during at least one grain loading event per calendar quarter. Monitoring may consist of visual observation. Recording may consist of electronic documents indicating the name of the observer, date (month day, year), time (HH:MM), and choke flow status.

C. POET Biorefining – Laddonia, LLC shall aspirate the grain pit being filled to CE01 Baghouse during each grain receiving event.

14. Record Keeping and Reporting Requirements

A. POET Biorefining – Laddonia, LLC shall maintain all records required by this permit for not less than five years and shall make them available to any Missouri Department of Natural Resources' personnel upon request. These records shall include SDS for all materials used.

B. POET Biorefining – Laddonia, LLC shall report to the Air Pollution Control Program's Compliance/Enforcement Section, by mail at P.O. Box 176, Jefferson City, MO 65102 and by email at AirComplianceReporting@dnr.mo.gov, 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.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (5) REVIEW
Project Number: 2019-05-015
Installation ID Number: 007-0054
Permit Number: 112020-013

Installation Address:	Parent Company:
POET Biorefining – Laddonia, LLC	POET Biorefining, LLC
809 North Pine	809 North Pine
Laddonia, MO 63352	Laddonia, MO 63352

Audrain County, S36, T52N, R7W

REVIEW SUMMARY

- POET Biorefining – Laddonia, LLC has applied for authority to install new equipment and modify existing equipment to increase ethanol production to 90,000,000 gallons per year.

- The application was deemed complete on June 20, 2019.

- HAP emissions are expected from the proposed new and modified equipment. HAPs are emitted from all sources handling beer, ethanol, DDGS, syrup, grain oil, and wetcake. The primary HAPs of concern from these processes are acrolein, formaldehyde, acetaldehyde, and methanol. HAPs are emitted from the combustion of natural gas. The primary HAPs of concern from the combustion of natural gas are hexane, formaldehyde, toluene, and benzene. HAPs are emitted from all sources handling denaturant. HAPs of concern are hexane, toluene, benzene, xylene, and 2,2,4-trimethylpentane. HAPs are emitted from the storage of corrosion inhibitor. HAPs of concern are methanol, ethylbenzene, and xylene.

- 40 CFR Part 60, Subpart Dc – *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units* applies to EP13 and EP14 Boilers.

- 40 CFR Part 60, Subpart Kb – *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984* applies to TK01, TK02, TK03, TK04, and TK05 Tanks. NSPS Kb does not apply to the Whole Stillage Tank or TK07 Syrup Tank. The Whole Stillage Tank meets the definition of *process tank* at §60.111b and does not meet the definition of *storage vessel* at §60.111b. TK07 has a capacity of 231 m^3 and is storing syrup which has a maximum true vapor pressure of 3.27 kPa; therefore, TK07 is exempt per §60.110b(b).

- 40 CFR Part 60, Subpart DD – *Standards of Performance for Grain Elevators* is not applicable to the installation. Although the installation handles grain, the installation does not meet the definitions of *grain terminal elevator* or *grain storage elevator* at §60.300. The installation is not a *grain storage elevator* as the installation is not a wheat flour mill, wet grain mill, dry grain mill, rice mill, or soybean oil extraction plant. The installation is not a *grain terminal elevator* as permanent storage capacity does not exceed 2.5 million bushels. The installation operates three 505,000 bushel storage bins, two 430,000 bushel storage bins, and one 50,000 bushel storage bin resulting in a total permanent storage capacity of 2.425 million bushels.

- 40 CFR Part 60, Subpart VVa – *Standards of Performance for Equipment Leaks for VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006* is applicable to FS03 Fermentation & Distillation Processes Equipment Leaks and FS04 Tank Farm Equipment Leaks.

- 40 CFR Part 60, Subpart XX – *Standards of Performance for Bulk Gasoline Terminals* is not applicable to the installation. The installation does handle gasoline; however, background documentation created during the development of the standard indicates receiving gasoline solely by truck was excluded from the scope of NSPS XX. See EPA's Clean Air Applicability Determination Index Control Number: 0900007.

- 40 CFR Part 60, Subpart NNN – *Standards of Performance for Volatile Organic Compound Emissions from SOCMI Distillation Operations* is not applicable to the installation. Ethanol is listed as a chemical affected by NSPS NNN; however, background documentation created during the development of the standard indicates creation of ethanol by fermentation (biological synthesis) was excluded from the scope of NSPS NNN. See EPA's Clean Air Applicability Determination Index Control Number: 0100076.

- 40 CFR Part 60, Subpart RRR – *Standards of Performance for Volatile Organic Compound Emissions from SOCMI Reactor Processes* is not applicable to the installation. Ethanol is listed as a chemical affected by NSPS RRR; however, background documentation created during the development of the standard indicates creation of ethanol by fermentation (biological synthesis) was excluded from the scope of NSPS RRR. See EPA's Clean Air Applicability Determination Index Control Number: 0100076.

- 40 CFR Part 63, Subpart Q – *National Emission Standards for HAP from Industrial Process Cooling Towers* is not applicable to the installation. The installation does not use chromium-based water treatment chemicals in CWT Cooling Tower; therefore, the installation does not meet the applicability requirements of §63.400(a).

- 40 CFR Part 63, Subpart R – *National Emission Standards for Gasoline Distribution Facilities (Bulk Gasoline Terminals and Pipeline Breakout Stations)* is not applicable to the installation. The installation does not meet the definition of *bulk gasoline terminal* at §63.421 as the installation does not receive gasoline by pipeline, ship or barge. The installation receives all of their gasoline by truck. See EPA's Clean Air Applicability Determination Index Control Number: M970025.

- 40 CFR Part 63, Subpart EEEE – *National Emission Standards for Hazardous Air Pollutants: Organic Liquids Distribution (Non-Gasoline)* is not applicable to the installation. The installation is not a major source of HAPs.

- 40 CFR Part 63, Subpart FFFF – *National Emission Standards for Hazardous Air Pollutants: Miscellaneous Organic Chemical Manufacturing* is not applicable to the installation. The installation is not a major source of HAPs.

- 40 CFR Part 63, Subpart DDDDD – *National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters* is not applicable to the installation. The installation is not a major source of HAPs.

- 40 CFR Part 63, Subpart BBBBBB – *National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Distribution Bulk Terminals, Bulk Plants, and Pipeline Facilities* may apply. The installation currently uses natural gasoline as their denaturant. Natural gasoline does not meet the definition of *gasoline* at §63.11100 as the octane content of natural gasoline is too low for natural gasoline to be used as a fuel for internal combustion engines. The installation is allowed to use gasoline or unleaded gasoline as their denaturant. If the installation begins using gasoline or unleaded gasoline as their denaturant, the installation will become subject to this regulation.

- 40 CFR Part 63, Subpart CCCCCC – *National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities* applies to TK08 Gasoline Tank for Plant Vehicles. The natural gasoline stored in the denaturant storage tanks (TK01 and TK03) does not meet the definition of *gasoline* at §63.11132 as its octane content is insufficient for it to be used as a fuel in internal combustion engines.

- 40 CFR Part 63, Subpart JJJJJJ – *National Emission Standards for HAP from Industrial, Commercial, and Institutional Boilers Area Sources* is not applicable to the installation. §63.11195(e) exempts gas-fired boilers.

- 40 CFR Part 63, Subpart VVVVVV – *National Emission Standards for Hazardous Air Pollutants for Chemical Manufacturing Area Sources* is not applicable to the installation. The installation does generate some acetaldehyde as a byproduct; however, the concentration of acetaldehyde in each liquid stream (process or waste) and continuous process vent are less than 0.1 wt%; therefore, the installation does not meet the applicability requirements of §63.11494(a)(2)(iii). Data from POET's Alexandria, Indiana plant indicates that the concentration of acetaldehyde is 0.003 wt% in the beerwell, 0.009 wt% in the scrubber bottoms, 0.0001 wt% in the beer stripper bottoms, and 0.027 wt% in the 200-proof storage tank. Stack testing performed in May 2016 on FERMVENT indicates concentrations of <200 ppmv.

- 40 CFR Part 63, Subpart DDDDDDD – *National Emission Standards for Hazardous Air Pollutants for Area Sources: Prepared Feeds Manufacturing* is not applicable to the installation. The installation does not add any material containing chromium or manganese to their DDGS.

- Packed bed wet scrubbers are being using to control VOC, HAP, and condensable particulate emissions from the fermentation and distillation processes. A RTO is being using to control VOC, HAP, and particulate emissions from the packed bed wet scrubbers, DDGS dryers, seven centrifuges, the whole stillage tank, and the grain oil system. The majority of the exhaust from the DDGS fluid bed cooler is used as combustion air for the DDGS dryers and subsequently controlled by the RTO. Baghouses are being used to control particulate emissions from grain receiving, handling, and storage operations; the DDGS fluid bed cooler; the DDGS silo; the DDGS silo bypass; the six hammermills; and the flour conveyor. Inherent multiclones are being used to settle DDGS out in the DDGS dryers. A flare is being used to control emissions from denatured ethanol truck loadout. Equipment leaks are being controlled under LDAR requirements in NSPS VVa.

- This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. The project emissions increases of PM, PM_{10}, $PM_{2.5}$, and VOC are above the de minimis levels and the project emissions increases of acrolein are above the SMAL.

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

- This installation is not on the List of Named Installations found in 10 CSR 10-6.020(3)(B), Table 2 or at §52.21(b)(1) as facilities that produce ethanol by natural fermentation (NAICS 325193) are excluded from the chemical process plants category; therefore, the installation's major source level is 250 tons per year and fugitive emissions are not counted toward major source applicability, with the exception of fugitive emissions from NSPS VVa and NSPS Kb emission sources.

- Ambient air quality modeling was performed to determine the ambient impact of PM_{10}, $PM_{2.5}$, and acrolein. No model is currently available which can accurately predict ambient ozone concentrations caused by this installation's VOC emissions. No NAAQS has been established for PM.

- Emissions testing is required as a part of this permit. Testing may also be required as part of other state, federal or applicable rules.

- An update to Part 70 operating permit application, 2019-10-003, is required within one year of start-up of the 8^{th} fermentation tank.

- Approval of this permit is recommended with special conditions.

INSTALLATION DESCRIPTION

POET Biorefining, LLC operates an ethanol production plant in Laddonia, MO. Currently a maximum of 700,000 tons of grain per year are processed to produce 72,150,000 gallons of 200 proof ethanol, 184,000 tons of DDGS, 12,884 tons of grain oil, 45,000 tons of wet cake, and 32,000 tons of syrup per year. The grain is received and stored on site prior to cleaning and milling. The grain handling equipment is enclosed and vented to a baghouse with negative pressure. Once the grain is cleaned, it is then ground with hammermills. Emissions from each of the four hammermills and grain cleaners are controlled by baghouses with negative pressure. The milled grain is then blended with water and enzymes to form a mash slurry for the fermentation process. Yeast and more enzymes are added to this mash in the seven fermentation tanks.

After batch fermentation, the resultant ethanol mixture (beer) is distilled in a series of distillation columns. The resultant products are approximately 190-proof ethanol and whole stillage. Using molecular sieves, the remaining water is removed from the ethanol to produce 200-proof ethanol. This is then blended with denaturant and shipped as denatured ethanol. 190-proof or 200-proof ethanol[14] may be shipped without the addition of denaturant.

The whole stillage is centrifuged to yield thin stillage and solid fractions (wet cake). The thin stillage is further treated in a series of evaporators to produce grain oil and syrup. This syrup is combined with the centrifuged wet cake and dried and cooled in a series of ring driers to produce DDGS.

Two ring dryers are used to dry the DDGS. The air and water vapor from this process pass through multiclones to collect additional DDGS product and control particulate emissions. The DDGS is cooled in a fluid bed cooler. The DDGS is stored in a silo or in flat storage and then loaded into trucks or railcars for distribution. The DDGS loadout system is controlled by a baghouse to minimize emissions.

Products consist of denatured ethanol, 200-proof ethanol, 190-proof ethanol, wet cake, DDGS, grain oil, syrup, and liquid CO_2.

Emissions from the fermentation and distillation processes are normally controlled by a packed bed wet scrubber. During normal operations, emissions from the packed bed scrubber, the multiclones on the two DDGS dryers, the five centrifuges, and the grain oil system are controlled by a RTO (EP09). During normal operations, ~ 83% of the exhaust from the DDGS Fluid Bed Cooler is routed to the DDGS Dryers as combustion air while the other ~ 17% of the exhaust is emitted out of EP10. During scrubber bypass, emissions from the fermentation and distillation processes vent to FERMVENT. Scrubber bypass is currently limited to 40 hours per year. During RTO bypass, emissions from the packed bed scrubbers vent to EP08, emissions from the five centrifuges vent to CENTVENT, the DDGS dryers are prohibited from operation, 100% of DDGS fluid bed cooler emissions vent to EP10, and the grain oil system vents directly to atmosphere. RTO bypass is currently limited to 500 hours per year.

[14] 200-proof ethanol is also known as anhydrous ethanol.

Process steam is produced by two natural gas-fired boilers, each rated at 100 MMBtu/hr. Additional steam is also supplied by one heat recovery steam generator that is associated with a natural gas fired turbine operated by the Missouri Joint Municipal Electric Utility Commission (MJMEUC, see Project 2006-06-002). MJMEUC has previously been determined to be a separate installation from POET Biorefining – Laddonia, LLC. The two facilities are located adjacent to each other; however, the two facilities do not meet the definition of one installation as MJMEUC and POET Biorefining – Laddonia, LLC belong to two separate industrial groupings and are not under common control. MJMEUC operates under SIC 49 “Electric, Gas, and Sanitary Services” while POET Biorefining – Laddonia, LLC operates under SIC 28 “Chemicals and Allied Products”. MJMEUC is not considered a support facility for POET Biorefining – Laddonia, LLC as POET Biorefining - Laddonia, LLC has the capability to produce enough steam for their operations using EP13 and EP14 Boilers and does not obtain their electricity from MJMEUC. The facilities are not under common control as there is no contractual agreement between the two facilities for the sale/purchase of steam.

A 250,000-gallon storage tank is available for 190-proof ethanol (TK02). The 200-proof ethanol is stored in two 1,500,000 gallon storage tanks (TK04 and TK05). Denaturant is stored in two 250,000 gallon tank (TK01 and TK03). The 200-proof ethanol is mixed with the denaturant at the truck and rail loadouts for delivery to customers through the loadout system via inline blending. Emissions from truck loadout are normally controlled by a flare. The installation is currently allowed to loadout up to 2,000,000 gallons of denatured, 200-proof, and190-proof ethanol combined without using the flare. Emissions from the rail loadout are uncontrolled, but are limited to railcars in dedicated normal denatured ethanol service.

The following New Source Review permits have been issued to POET Biorefining - Laddonia, LLC from the Air Pollution Control Program:

Table 8: Permit History

Permit	Description
022003-004	Installation of a 30,000,000 gpy ethanol plant. However, the plant was never constructed
022003-004A	Extension of time to construct for the ethanol plant.
102005-015	Installation of a 56,000,000 gpy ethanol plant. This permit replaced Permit 022003-004.
102005-015A	Increasing the production of the ethanol plant to 68,000,000 gpy
102005-015B	Supplement raw materials
102005-015C	Removal of acrolein limit
102017-014	Installation of a 7th fermentation tank
042019-015	Increasing production to 72,150,000 gpy 200-proof ethanol

PROJECT DESCRIPTION

POET Biorefining – Laddonia, LLC has applied for authority to install new equipment and modify existing equipment to increase ethanol production to 90,000,000 gallons per year as follows:

- Install two additional hammermills each with their own dedicated baghouse (CE21 and CE22).
- Replace the existing flour conveyor with a larger flour conveyor. The new flour conveyor will be controlled by the existing CE07 Baghouse.
- Combine the exhausts from the baghouses on the four existing hammermills (CE03, CE04, CE05, and CE06), two additional hammermills (CE21 and CE22), and the new flour conveyor (CE07) and vent them to a new stack (EP21).
- Install an 8th 570,000 gallon fermentation tank, a 2nd yeast propagation tank, a 2nd beer well, a 2nd beer stripper, a 4th molecular sieve bottle, and two evaporators. The new fermentation tank, yeast propagation tank, beer well, beer stripper, molecular sieve bottle, and evaporators will normally be controlled by a packed bed wet scrubber (CE08A or CE08B) and RTO (CE11).
- Install a 25,000 gallon whole stillage tank and two centrifuges. The new whole stillage tank and centrifuges will normally be controlled by the existing RTO (CE11).
- Install a 2nd ethanol rail loadout skid.
- Install a grain oil loadout skid.
- Allow for DDGS loadout into containers as part of existing FS07 DDGS Loadout.
- Increase the maximum grain receiving/processing limit to 884,211 tpy.
- Increase the maximum denaturant receiving/blending limit to 4,736,900 gpy.
- Increase the maximum DDGS production/shipping limit to 230,000 tpy.
- Increase the maximum wet cake production limit to 150,000 tpy.

<u>PSD Applicability</u>
The installation is not a named source in Missouri's SIP; therefore, the installation's major source threshold is 250 tpy and fugitive emissions do not count towards major source applicability, with the exception of fugitives from emission sources subject to NSPS Kb and NSPS VVa.

The installation's post-project potential installation-wide emissions are less than 250 tpy for each criteria pollutant; therefore, PSD is not triggered.

It was not determined if this project should be aggregated with the 2019 production increase (Permit 042019-015). As potential installation-wide post-project emissions are less than 250 tpy, a decision was unnecessary to determine that a PSD permit was not required for this project.

<u>Minor NSR Applicability</u>
Project emissions from modified existing sources were determined to be the difference between the post-project potential to emit and the pre-project potential to emit. Project emissions from new sources were based on the potential to emit. The project results in emissions increases of PM, PM_{10}, $PM_{2.5}$, and VOC above de minimis levels and of acrolein above the SMAL. There is no NAAQS promulgated for PM; therefore, PM

ambient air modeling was not performed. No model is currently available which can accurately predict ambient ozone concentrations caused by this installation's VOC emissions; therefore, VOC ambient air modeling was not performed. PM_{10}, $PM_{2.5}$, and acrolein modeling was performed; refer to the Ambient Air Quality Impact Analysis section of this permit for additional information.

This permit supersedes all of the special conditions in Permit 042019-015. The installation requested to supersede multiple limits that were contained in Permit 042019-015; therefore, for minor NSR purposes this project was conservatively aggregated with Permit 042019-015.

Permit 042019-015 Special Condition 2.A limited the entire installation to 50 tpy of total PM_{10} to avoid modeling. The installation chose to model PM_{10} emissions from the entire installation for this permit rather than re-instate this limit.

Permit 042019-015 Special Condition 2.B limited the entire installation to 44.96 tpy of total $PM_{2.5}$ to avoid modeling. The installation chose to model $PM_{2.5}$ emissions from the entire installation for this permit rather than re-instate this limit.

Permit 042019-015 Special Condition 2.C limited the entire installation to 64.98 tpy of NO_x to avoid modeling. This limit was determined to be unnecessary. Permit 042019-015 evaluated the project emission increase as the difference between the post-project potential to emit and the average baseline actual emissions from the 2016 and 2017 calendar years; however, 10 CSR 10-6.060(2)(F) defines emissions increase as "the sum of post-project potential to emit minus the pre-project potential to emit for each and modified emission unit." According to OP2015-001, pre-project installation-wide NO_x potential emissions were 57.76 tpy. Installation-wide post-project NO_x potential emissions will be 82.76 tpy. As the emissions increase is less than 40 tpy, NO_x modeling is not required and a limit to avoid NO_x modeling is unnecessary.

Permit 042019-015 Special Conditions 2.D and 2.E limited the entire installation to 100 tpy of VOC and CO, respectively, to remain a synthetic minor NSR source as at the time ethanol plants were named sources in Missouri's SIP (but no in the CSR or CFR). Missouri's SIP has since been modified such that the installation is no longer a named installation. The installation's major source threshold is now 250 tpy. Post-project potential emissions indicate that the installation is naturally below 250 tpy; therefore, these limits were deemed unnecessary in this permit.

Permit 042019-015 Special Condition 2.F limited the entire installation to the SMALs for each individual HAP (excluding acrolein), to 10 tpy for acrolein, and to 25 tpy of combined HAP. Post-project potential emissions for the installation indicate that the installation is naturally below these levels; therefore, these limits were deemed unnecessary in this permit.

The emission source specific PM_{10} emission limits in Permit 042019-015 Special Condition 2.G have been superseded and replaced by emission source specific PM_{10} emission limits in this permit consistent with the new PM_{10} modeling analysis conducted for this permit.

The emission source specific NO_x emission limits in Permit 042019-015 Special Condition 2.H have been superseded and replaced by emission source specific NO_x emission limits in this permit. POET Biorefining – Laddonia, LLC requested to lower the NO_x limit on EP09 as part of this project to avoid NO_x modeling for the project.

The emission source specific acrolein emission limits in Permit 042019-015 Special Condition 2.I have been superseded and replaced by emission source specific acrolein emission limits in this permit. The acrolein limits in this permit are based on the acrolein modeling inputs.

Permit 042019-015 Special Condition 3 contained limits on grain receiving, DDGS production, wet cake production, 200-proof ethanol production, and denaturant receiving. The installation requested to increase these limits as part of this project. New limits can be found in Special Condition 3 of this permit. This permit also includes a restriction on denaturant as a change in denaturant greatly affects installation-wide HAP emissions. This permit contains 12-month rolling total receiving/shipping limits based on the $PM_{2.5}$ and acrolein annual modeling analyses. This permit also contains an installation-wide haul road speed limit, daily grain receiving limit, and time of day restrictions on grain receiving and DDGS loadout based on the PM_{10}, $PM_{2.5}$, and acrolein 24-hour modeling analyses.

Permit 042019-015 Special Conditions 4 and 5 contained performance testing requirements. POET Biorefining – Laddonia, LLC has already conducted the required performance testing and is currently in the process of drafting the stack test report for submittal to the Air Pollution Control Program. These stack testing results would not be representative for determining compliance with the limits in this permit as they were conducted prior to the installation and modification of multiple emission sources; therefore, new stack testing is being required by Special Conditions 4 and 5 of this permit. This permit contains CO testing for the boilers. NO_x and CO emissions tend to share an inverse relationship. In order to ensure that the AP-42 CO emission factor is still representative at the NO_x limits imposed on the boilers, testing is being required.

Permit 042019-015 Special Condition 6 contained practically enforceable requirements for the operation of the packed bed wet scrubber and RTO. In order to make these control devices practically enforceable for the new/modified equipment associated with this permit and to reduce the number of scrubber bypass hours this special condition was superseded and re-instated in Special Condition 6 of this permit.

Permit 042019-015 Special Condition 7 contained PM_{10} NAAQS and increment requirements. This condition was superseded and re-instated to include $PM_{2.5}$ as well as PM_{10}.

Permit 042019-015 Special Condition 8 contained acrolein modeling restrictions. This condition was superseded and re-instated to include PM_{10}, $PM_{2.5}$, and acrolein modeling restrictions.

Permit 042019-015 Special Condition 9 contained DDGS transfer and loadout time of day restrictions. This condition was superseded and re-instated in Special Condition 3 of this permit. Time of day restrictions on grain receiving have also been included in this permit based on the PM_{10} and $PM_{2.5}$ modeling analyses.

Permit 042019-015 Special Condition 10 contained restrictions on EP12 DDGS Silo Bypass throughput. This condition was superseded and replaced with a 46,000 tpy throughput restriction in Special Condition 3 of this permit based on the PM_{10} and $PM_{2.5}$ modeling analyses. The new restriction also applies to FS06 DDGS Flat Storage.

Permit 042019-015 Special Condition 11 contained practically enforceable requirements for the operation of baghouses. In order to make these control devices practically enforceable for the new/modified equipment associated with this permit, this condition was superseded and re-instated in Special Condition 9 of this permit.

Permit 042019-015 Special Condition 12 contained practically enforceable requirements for the operation of multiclones. Information provided as part of the review of this project indicates the multiclones are inherent control devices. The multiclones would be in use regardless of air pollution regulations as they are used to remove the DDGS from the air it is entrained in. Without the multiclones, the installation would be sending one of their main products to atmosphere.

Permit 042019-015 Special Condition 13 contained practically enforceable requirements for the operation of a flare. This condition was superseded and re-instated in Special Condition 10 of this permit.

Permit 042019-015 Special Condition 14 contained haul road restrictions. This condition was superseded and re-instated in Special Condition 11 of this permit. This permit also contains silt loading requirements based on the PM_{10} and $PM_{2.5}$ modeling inputs.

Permit 042019-015 Special Condition 15 contained railcar restrictions. This condition was superseded and re-instated in Special Condition 3 of this permit.

Special Condition 12 contains restrictions on the cooling tower. These restrictions are based on the PM_{10} and $PM_{2.5}$ modeling inputs.

Special Condition 2.D restricts formaldehyde emissions from the project from exceeding the SMAL. The limit was set such that the emissions increase (i.e. post-project PTE of 2.16 tpy minus pre-project PTE of 0.16 tpy) did not exceed the SMAL.

EMISSIONS/CONTROLS EVALUATION

<u>FS01 Grain Receiving Fugitives</u>

Particulate fugitive emissions from grain receiving were calculated from emission factors in AP-42 Section 9.9.1 “Grain Elevators & Processes” (May 2003); assuming 45% control of PM and PM_{10} for choke loading and 20% control of $PM_{2.5}$ for choke loading;

25% of grain is received from straight trucks while the remaining 75% is received from hopper trucks; a calculated capture efficiency for the aspirated grain receiving pits of 93% (based on a maximum of 15.625 trucks per hour, a truck volume of 1,620 ft^3, and Laddonia's fan speed of 23,450 ft^3/min); and a calculated building capture efficiency of 100% for PM, 5% for PM_{10}, and 0% for $PM_{2.5}$. A video taken in July 2019 of grain receiving occurring at POET Biorefining – Laddonia, LLC supports that choke flow occurs shortly after grain receiving begins. Emissions from the aspirated grain receiving pits are accounted for under EP01. These calculations yield a similar but slightly lower capture efficiency than provided by the applicant based on capture efficiency testing conducted at POET Bushmill.

FS02 Paved Haul Roads

Particulate emissions from haul roads were calculated using equations in AP-42 Section 13.2.1 "Paved Roads" (January 2011). The PM_{10} and $PM_{2.5}$ modeling analyses were based on two different paths. The first path was from Hwy 19 to the grain receiving/DDGS & wet cake loadout building and returning back to Hwy 19 for a length of 0.64 miles. This path is used by the grain, DDGS, and wet cake trucks. The second path was from Hwy 19 to the tank farm and returning to Hwy 19 for a length of 0.83 miles. This path is used by the denatured ethanol, 200-proof ethanol, 190-proof ethanol, denaturant, grain oil, liquid CO_2, syrup, and chemical trucks. Calculations include 105 rain days per year. The 10 mph speed limit and the length of the haul roads is sufficient to limit the number of trucks on the haul roads to the rates input into the modeling analyses, as the plant access road is only capable of supporting one-way traffic.

FS03 Fermentation & Distillation Processes Equipment Leaks

Fermentation process equipment leaks were calculated from seven pump seals in heavy liquid service, 140 valves in heavy liquid service, two gas valves, two open ended lines, and 450 connectors. The maximum VOC content within the fermentation process is 20%.

Distillation process equipment leaks were calculated from 11 pump seals in light liquid service, 275 valves in light liquid service, 50 gas valves, 11 relief valves, and 1300 connectors. The maximum VOC content within the distillation process is 100%.

VOC emission factors and LDAR control efficiencies were obtained from "Protocol for Equipment Leak Emission Estimates" (November 1995).

HAP emissions were estimated using the VOC emission factors and the ratio of acetaldehyde, formaldehyde, methanol, and acrolein to total VOC during the May 2016 packed bed wet scrubber inlet testing.

FS04 Tank Farm Equipment Leaks

Tank farm equipment leaks were calculated from seven pump seals in light liquid service, 156 valves in light liquid service, five gas valves, 34 relief valves, two sampling points, and 1023 connectors. The maximum VOC content within the tank farm is 100%.

VOC emission factors and LDAR control efficiencies were obtained from “Protocol for Equipment Leak Emission Estimates” (November 1995).

HAP emissions from tanks in denaturant service were estimated using the VOC emission factors and the vapor fraction of each individual HAP. Vapor fractions were calculated using Raoult’s Law. The liquid HAP fractions for the use of natural gasoline as denaturant were obtained from five different analyses conducted on the Enterprise denaturant in 2016. The liquid HAP fractions for the use of gasoline and/or unleaded gasoline as denaturant were based on values obtained from Flint Hills Resources’ SDS No. 10103 for Gasoline (Version #2, December 2014) and RTI Internationals’ “Emissions Estimation Protocol for Petroleum Refineries” (Version #3, April 2015).

FS05 Wet Cake Production

VOC and HAP emissions from wet cake are based on chemical analyses performed by Keystone Laboratories of wet cake and thin stillage samples conducted in 2015 indicating that each kilogram of wet cake contains 12.8 mg ethanol, 5.2 mg methanol, 4.99 mg formaldehyde, and 2.5 mg acetaldehyde. Acrolein has not been detected in wet cake. Evaporation calculations indicate that all of the acrolein will have evaporated prior to wet cake storage as the whole stillage would only need to reside in the centrifuges for three seconds in order for all of the acrolein to evaporate there.

Wet cake has a high moisture content and is not considered a particulate emission source.

The MHDR of FS05 is 45 tph wet cake.

FS06 DDGS Flat Storage

Particulate emissions were determined using emission factors obtained from AP-42 Section 9.9.1 “Grain Elevators & Processes” (May 2003). A building capture efficiency of 82.88% for PM, 0.83% for PM_{10}, and 0.05% for $PM_{2.5}$ was estimated using the AP-42 particle size distribution, the average settling velocity calculated according to Stokes’ Law, and building parameters.

VOC and HAP emissions were determined using stack tested emission factors from similar operations at POET Biorefining, LLC’s Gowrie and Corning locations in November 2017 and October 2017, respectively. Chemical analyses of DDGS performed by Inovatia Laboratories, LLC in October 2019 could not detect acrolein. The detection limit was 30 µg/kg.

The MHDR of FS03 is 30 tph DDGS.

FS07 DDGS Loadout

Particulate emissions were determined using emission factors obtained from AP-42 Section 9.9.1 “Grain Elevators & Processes” (May 2003). A building capture efficiency of 82.88% for PM, 0.83% for PM_{10}, and 0.05% for $PM_{2.5}$ was estimated using the AP-42 particle size distribution, the average settling velocity calculated according to Stokes' Law, building parameters, and videos taken in October 2018 and July 2019 of DDGS loadout occurring at POET Biorefining – Laddonia, LLC.

VOC and HAP emissions were determined using stack tested emission factors from similar operations at POET Biorefining, LLC's Gowrie and Corning locations in November 2017 and October 2017, respectively. Chemical analyses of DDGS performed by Inovatia Laboratories, LLC in October 2019 could not detect acrolein. The detection limit was 30 µg/kg.

The MHDR of FS07 is 115 tph DDGS. This is the MHDR of the loadout spout and is applicable to both truck and rail loadout. There is only one loadout spout; therefore, truck and rail loadout cannot occur simultaneously.

In previous projects, DDGS Transfer & Loadout were evaluated as a controlled source; however, further discussions with the installation indicate that only DDGS transfer emissions are controlled by CE01 Baghouse. The DDGS loadout spout is not aspirated to the baghouse.

EP01 Grain Receiving, Transfer, and Storage & DDGS Transfer

PM_{10} emissions were determined based on the modeling inputs and established as limits in this permit. $PM_{2.5}$ emissions were assumed to be equal to PM_{10} emissions. PM emissions were determined using the PM_{10} emissions and the PM to PM_{10} ratio in AP-42 Section 9.9.1 "Grain Elevators & Processes" (May 2003). Particulate emissions are controlled by a baghouse.

VOC and HAP emissions from DDGS transfer were determined using stack tested emission factors from similar operations at POET Biorefining, LLC's Gowrie and Corning locations in November 2017 and October 2017, respectively. Chemical analyses of DDGS performed by Inovatia Laboratories, LLC in October 2019 could not detect acrolein. The detection limit was 30 µg/kg.

The MHDR of grain receiving is 840 tph grain. The MHDR of DDGS transfer is 115 tph DDGS. Grain receiving and DDGS transfer can occur simultaneously. Grain receiving via truck and rail can occur simultaneously.

EP02 Grain Scalper, Conveyor and Surge Bin

PM_{10} and $PM_{2.5}$ emissions were determined based on the modeling inputs and established as limits in this permit. PM emissions were determined using the PM_{10} emissions and the PM to PM_{10} ratio in AP-42 Section 9.9.1 "Grain Elevators & Processes" (May 2003). Particulate emissions are controlled by a baghouse.

The MHDR of EP02 is 140 tph.

EP09 Packed Bed Wet Scrubber, DDGS Fluid Bed Cooler, (2) DDGS Dryers, (7) Centrifuges, Whole Stillage Tank, Grain Oil System, and CE11 RTO

CO, VOC, acetaldehyde, formaldehyde, and methanol emissions were determined using the worst-case emission factors (lb/kgal beer) from the March 2007, May 2011, May 2016, and March 2018 stack tests. These tests were conducted at the outlet of the RTO; therefore, no additional control efficiencies were applied.

NO_x, PM, PM_{10}, $PM_{2.5}$, and acrolein emissions were determined based on the emission limits proposed by the installation and included in this permit.

SO_2 and other individual HAP emissions were determined using the emission factors in AP-42 Section 1.4 “Natural Gas Combustion” (July 1998).

The MHDR of EP09 is 1000 gpm beer (60 kgal/hr beer). The MHDR of the RTO is 30 MMBtu/hr natural gas. The MHDR of each DDGS dryer is 60.5 MMBtu/hr natural gas. The DDGS dryers operate in series.

RTO Bypass

CENTVENT: VOC, acetaldehyde, formaldehyde, methanol, and acrolein emissions from the seven centrifuges were determined using emission factors (lb/kgal beer) from the March 2018 stack test. During RTO bypass, these emissions vent to CENTVENT. The MHDR of the centrifuges is 1000 gpm beer combined. No particulate emissions were calculated for this emission source.

EP08: VOC, acetaldehyde, formaldehyde, and methanol emissions from the fermentation and distillation processes were determined using the worst-case emission factors (lb/kgal beer) from the March 2007, May 2011, and May 2016 stack tests. These tests were conducted at the outlet of the packed bed wet scrubber; therefore, no additional control efficiencies were applied. Acrolein emissions were based on the limit proposed by the installation and included in this permit. During RTO bypass, these emissions vent to EP08. The MHDR of the fermentation and distillation processes is 1000 gpm beer combined. No particulate emissions were calculated for this emission source.

WHOLE: VOC, acetaldehyde and formaldehyde emissions from the whole stillage tank were determined using the ethanol, acetaldehyde, and formaldehyde liquid concentrations in whole stillage from the chemical analysis performed by Keystone Laboratories in 2015, vapor-liquid equilibrium data for dilute solutions of ethanol in water, and Raoult’s Law. The 2015 Keystone Laboratories report indicates 20 ppmw ethanol, 2 ppmw actaldehyde, and 4.89 ppmw formaldehyde. The whole stillage tank operates at 195°F. During RTO bypass, these emissions vent to atmosphere. The MHDR of the whole stillage tank is 8.1 kgal/hr whole stillage. Methanol and acrolein have not been detected in whole stillage. The detection limits were 10 mg/L and 0.5 mg/L, respectively in the Keystone Laboratories 2015 chemical analysis. The methanol concentration was estimated to be 3.37 ppm based on the wet cake chemical analysis.

OIL: VOC emissions from the grain oil system tanks were determined using TANKS 4.0.9d. Acetaldehyde, formaldehyde, and methanol emissions from the grain oil system were determined using the ratio of their respective vapors to VOC vapors from the whole stillage tank calculations. During RTO bypass, these emissions vent to atmosphere. The MHDR of the grain oil system is 8.1 kgal/hr grain oil.

Use of the DDGS Dryers is prohibited during RTO bypass; therefore, wet cake is produced during periods of RTO bypass.

<u>Scrubber Bypass (FERMVENT)</u>

VOC, acetaldehyde, formaldehyde, methanol, and acrolein emissions from the fermentation and distillation processes were determined using emission factors (lb/kgal beer) from the May 2016 stack test. During scrubber bypass, these emissions vent to FERMVENT. The MHDR of the fermentation and distillation processes is 1000 gpm beer. No particulate emissions were calculated for this emission source.

<u>EP10 DDGS Fluid Bed Cooler</u>

VOC, acetaldehyde, formaldehyde, methanol, acrolein, and particulate emissions were determined using worst-case emission factors (lb/ton DDGS) from the March 2007, May 2011, and May 2016 stack tests. These tests were conducted after the baghouse; therefore, no additional control efficiency was applied to the particulate emission factors. All PM and PM_{10} was assumed to be $PM_{2.5}$. During the March 2007 stack test 100% of the exhaust flow from the DDGS Fluid Bed Cooler was vented to EP10 (i.e. 24,855 dscfm). During the May 2011 and May 2016 stack tests the exhaust flows from EP10 were only 1,352 dscfm and 4,203 dscfm, respectively, as part of the exhaust from the DDGS Fluid Bed Cooler was being routed to the DDGS Dryers' burners for use as combustion air and vented with the DDGS Dryers' emissions to the RTO and out of EP09. It is assumed that the concentrations of pollutants in the exhaust flowing to EP10 and the DDGS Dryers' burners are equivalent. Prior to this project, the Air Pollution Control Program was unaware that POET Biorefining – Laddonia, LLC was venting part of the emissions from the DDGS Fluid Bed Cooler to the DDGS Dryers' burners. As part of this project, the installation is requesting 200 hours of 100% emission from EP10 (i.e. to use fresh ambient air as combustion air for the DDGS Dryers). During normal operations, while using DDGS Fluid Bed Cooler exhaust as combustion air for the DDGS Dryers, the flow out of EP10 should be less than 7,000 dscfm; therefore, potential emissions are based on 200 hours at 24,855 dscfm and 8,760 hours at 7,000 dscfm. A practically enforceable requirement for the DDGS Dryers to use the exhaust from the DDGS Fluid Bed Cooler has been added to this permit.

The DDGS Fluid Bed Cooler has a MHDR of 30 tph DDGS and a maximum exhaust rate of 24,855 dscfm.

<u>EP11 DDGS Silo and EP12 DDGS Silo Bypass</u>

PM_{10} and $PM_{2.5}$ emissions were determined based on the modeling inputs and established as limits in this permit. PM emissions were determined using the PM_{10}

emissions and the PM to PM_{10} ratio in AP-42 Section 9.9.1 “Grain Elevators & Processes” (May 2003). Particulate emissions are controlled by a baghouse.

VOC and HAP emissions were determined using stack tested emission factors from similar operations at POET Biorefining, LLC’s Gowrie and Corning locations in November 2017 and October 2017, respectively. Chemical analyses of DDGS performed by Inovatia Laboratories, LLC in October 2019 could not detect acrolein. The detection limit was 30 µg/kg.

The MHDRs of EP11 and EP12 are 30 tph DDGS each.

<u>EP13 Boiler #1 and EP14 Boiler #2</u>

NO_x and PM_{10} emissions were determined based on the emission limits proposed by the installation and included in this permit. All PM_{10} is assumed to be $PM_{2.5}$.

VOC, PM, CO, SO_2 and individual HAP emissions were determined using the emission factors in AP-42 Section 1.4 “Natural Gas Combustion” (July 1998).

The MHDR of each boiler is 100 MMBtu/hr natural gas.

<u>EP15 Denatured Ethanol, 200-Proof Ethanol, and 190-Proof Ethanol Truck Loadout</u>

Uncontrolled VOC emissions were calculated using Equation 1 from AP-42 Section 5.2 “Transportation and Marketing of Petroleum Liquids” (July 2008). The incoming trucks are assumed to be saturated with gasoline RVP 15 vapors, S=0.5 (S=1 for dedicated vapor balance minus S=0.5 for clean cargo.) The outgoing trucks are being filled with either denatured ethanol, 200-proof ethanol, or 190-proof ethanol, S=0.5 for clean cargo.

Controlled VOC emissions are based on a capture efficiency of 99.2% and a flare destruction efficiency of 98%. The 99.2% is for trucks subject to MACT R. The installation is not subject to MACT R; however, they assume that their incoming trucks previously held gasoline RVP 15. These trucks would have been required to achieve 99.2% capture under MACT R in order to have previously held gasoline RVP 15. The flare’s destruction efficiency was verified in May 2016.

HAP emissions from loading to trucks saturated with gasoline vapors were determined using the individual HAP concentrations in gasoline from an SDS (December 2014) for Flint Hill Resources’ gasoline and RTI International’s “Emissions Estimation Protocol for Petroleum Refineries” (April 2015) and the VOC emission factors.

HAP emissions from denaturant (natural gasoline) loadout were determined using the VOC emission factors, Raoult’s Law, and the liquid HAP fractions from five different analyses conducted on the Enterprise natural gas denaturant in 2016. HAP emissions from denaturant (gasoline or unleaded gasoline) loadout were determined using the VOC emission factors, Raoult’s Law, and the liquid HAP fractions from an SDS

(December 2014) for Flint Hill Resources' gasoline and RTI International's "Emissions Estimation Protocol for Petroleum Refineries" (April 2015).

HAP emissions from 200-proof ethanol and 190-proof loadout were determined using the VOC emission factors, Raoult's Law, and individual HAP contents in the 200-proof ethanol obtained from chemical analyses in February and March of 2016 at several POET Biorefining, LLC locations.

EP15 has a MHDR of 78 kgal/hr.

CO and NO_x emissions from the flare were determined using emission factors obtained from AP-42 Section 13.5 "Industrial Flares" (February 2018).

The flare has a MHDR of 2 MMBtu/hr.

<u>EP16 Denatured Ethanol, 200-Proof Ethanol, and 190-Proof Ethanol Rail Loadout</u>

VOC emissions were calculated using Equation 1 from AP-42 Section 5.2 "Transportation and Marketing of Petroleum Liquids" (July 2008). For railcars in dedicated normal denatured ethanol service, S was assumed to equal 0.6.

HAP emissions from denaturant (natural gasoline) loadout were determined using the VOC emission factors, Raoult's Law, and the liquid HAP fractions from five different analyses conducted on the Enterprise denaturant in 2016. HAP emissions from denaturant (gasoline or unleaded gasoline) loadout were determined using the VOC emission factors, Raoult's Law, and the liquid HAP fractions from an SDS (December 2014) for Flint Hill Resources' gasoline and RTI International's "Emissions Estimation Protocol for Petroleum Refineries" (April 2015).

HAP emissions from 200-proof ethanol and 190-proof ethanol loadout were determined using the VOC emission factors, Raoult's Law, and individual HAP contents in the 200-proof ethanol obtained from chemical analyses in February and March of 2016 at several POET Biorefining, LLC locations.

EP16 has a MHDR of 144 kgal/hr.

<u>EP21 (6) Hammermills and Flour Conveyor</u>

PM_{10} and $PM_{2.5}$ emissions were determined based on the modeling inputs and established as limits in this permit. PM emissions were determined using the PM_{10} emissions and the PM to PM_{10} ratio in AP-42 Section 9.9.1 "Grain Elevators & Processes" (May 2003). Particulate emissions are controlled by baghouses.

The MHDR of EP21 is 140 tph.

TK01 & TK03 Denaturant Storage Tanks

VOC emissions were calculated using the equations in AP-42 Section 7.1 "Organic Liquid Storage Tanks" (November 2019).

Each of these internal floating roof tanks has a capacity of 250,000 gallons. Individual HAP emissions were determined using the VOC emission factors, Raoult's Law, the liquid HAP fractions for natural gasoline obtained from five different analyses conducted on the Enterprise denaturant in 2016, and the liquid HAP fractions for gasoline obtained from an SDS (December 2014) for Flint Hill Resources' gasoline and RTI International's "Emissions Estimation Protocol for Petroleum Refineries" (April 2015). No emissions from roof landings or cleanings were calculated; therefore, roof landings and cleanings are not allowed.

TK02 190-Proof Ethanol Storage Tank

VOC emissions were estimated using TANKS 4.0.9d.

This internal floating roof tank has a capacity of 250,000 gallons. Individual HAP emissions were determined using the VOC emission factors, Raoult's Law, and individual HAP contents in the 200-proof ethanol obtained from chemical analyses in February and March of 2016 at several POET Biorefining, LLC locations. No emissions from roof landings or cleanings were calculated; therefore, roof landings and cleanings are not allowed.

TK04 & T05 200-Proof Ethanol Storage Tanks

VOC emissions were estimated using TANKS 4.0.9d.

Each of these internal floating roof tanks has a capacity of 1,500,000 gallons. Individual HAP emissions were determined using the VOC emission factors, Raoult's Law, and individual HAP contents in the 200-proof ethanol obtained from chemical analyses in February and March of 2016 at several POET Biorefining, LLC locations. No emissions from roof landings or cleanings were calculated; therefore, roof landings and cleanings are not allowed.

TK06 Corrosion Inhibitor Storage Tank

VOC emissions were estimated using TANKS 4.0.9d.

This fixed roof tank has a capacity of 1,000 gallons. Individual HAP emissions were determined based on the contents specified within the SDS provided by the applicant. Maximum annual throughput is 6,250 gallons.

TK07 Syrup Storage Tank

This fixed roof tank has a capacity of 61,000 gallons. VOC, acetaldehyde, methanol, and formaldehyde emissions from the syrup tank were determined using the ethanol, acetaldehyde, methanol, and formaldehyde liquid concentrations in whole stillage from the chemical analysis performed by Keystone Laboratories in 2015, vapor-liquid equilibrium data for dilute solutions of ethanol in water, and Raoult's Law. The 2015 Keystone Laboratories report indicates whole stillage contains 20 ppmw ethanol, 2 ppmw actaldehyde, and 4.89 ppmw formaldehyde. Whole stillage has a moisture content of 86%. As syrup has a moisture content of only 71%, the ethanol, acetaldehyde, and formaldehyde contents in syrup were assumed to be 83% (i.e. 71%/86%) of the ethanol, acetaldehyde, and formaldehyde contents in whole stillage. The syrup tank operates at 190°F. Maximum annual throughput is 4,800,000 gallons.

<u>TK08 Gasoline Tank for Plant Vehicles</u>

VOC emissions were estimated using emission factors obtained from WebFIRE for Process SCC 40301001 (breathing losses) and 40301007 (working losses).

This fixed roof tank has a capacity of 300 gallons. Monthly throughput is less than 10,000 gallons. HAP emissions were determined using the individual HAP concentrations in gasoline from an SDS (December 2014) for Flint Hill Resources' gasoline and RTI International's "Emissions Estimation Protocol for Petroleum Refineries" (April 2015) and the VOC emission factors.

<u>Other Tanks</u>

- 6,500 gallon fixed roof tank containing Chlorenix: HAP (HCl) emissions were estimated using the SDS and AP-42 Section 7.1 "Organic Liquid Storage Tanks" (November 2006).
- 12,000 gallon fixed roof tank containing Urea: NO_x emissions were estimated using AP-42 Section 7.1 "Organic Liquid Storage Tanks" (November 2006).
- 10,000 gallon fixed roof tank containing Sulfuric Acid: Sulfuric acid mist, condensable particulate, and SO_2 emissions were estimated using an emission factor obtained from WebFIRE for Process SCC 30102321.
- 12,000 gallon fixed roof tank containing Enzyme: no emissions are anticipated from this tank while holding Enzyme.

<u>CWT Cooling Tower</u>

PM emissions were calculated from mass balances using water circulation flow (27,900 gpm), drift loss (0.005%), and the total dissolved solids content (1500 ppm). PM_{10} emissions were determined using the PM to PM_{10} ratio provided by Reisman and Frisbie in "Calculating Realistic PM_{10} Emissions from Cooling Towers". All PM_{10} was assumed to be $PM_{2.5.}$

<u>FS08 Syrup and Grain Oil Loadout</u>

VOC, acetaldehyde, methanol, and formaldehyde emissions from the syrup tank were determined using the ethanol, acetaldehyde, methanol, and formaldehyde liquid concentrations in whole stillage from the chemical analysis performed by Keystone Laboratories in 2015, vapor-liquid equilibrium data for dilute solutions of ethanol in water, and Raoult's Law. The 2015 Keystone Laboratories report indicates whole stillage contains 20 ppmw ethanol, 2 ppmw actaldehyde, and 4.89 ppmw formaldehyde. Whole stillage has a moisture content of 86%. As syrup has a moisture content of only 71%, the ethanol, acetaldehyde, and formaldehyde contents in syrup were assumed to be 83% (i.e. 71%/86%) of the ethanol, acetaldehyde, and formaldehyde contents in whole stillage. As grain oil has a moisture content of only 1%, the ethanol, acetaldehyde, and formaldehyde contents in grain oil were assumed to be 1% (i.e. 1%/86%) of the ethanol, acetaldehyde, and formaldehyde contents in whole stillage.

The following table provides an emissions summary for this project. Existing potential emissions were taken from OP2015-001[15]. Existing actual emissions were taken from the installation's 2018 EIQ. The project emissions increase represents the increase in potential emissions (i.e. Post Project PTE minus Pre Project PTE, excluding any decreases), assuming continuous operation (8,760 hours per year).

Table 9: Emissions Summary (tpy)

Pollutant	Regulatory *De Minimis* Levels	Existing Potential Emissions	Existing Actual Emissions (2018 EIQ)	Project Emissions Increase	New Installation Potential to Emit
PM	25.0	N/D	N/A	52.84	76.48
PM_{10}	15.0	<50	43.80	45.88	69.95
$PM_{2.5}$	10.0	25.19	34.00[16]	43.37	65.09
SO_x	40.0	0.89	0.36	0.66	1.56
NO_x	40.0	57.75	29.25	37.89	82.76
VOC	40.0	46.68	61.87[16]	79.73	129.46
CO	100.0	<100	33.38	32.89	123.88
Sulfuric Acid Mist	7.0	N/D	N/A	0.70	0.70
Combined HAPs	25.0	11.68	4.42	16.85	23.34
Hexane (110-54-3)	10.0	8.22	1.87	3.02	9.20
Acetaldehyde (75-07-0)	10.0[17]	1.29	0.71	3.37	3.79
Methanol (67-56-1)	10.0[18]	0.71	1.08[16]	2.38	2.52
Toluene (108-88-3)	10.0[18]	0.13	0.01	2.28	2.41
Formaldehyde (50-00-0)	10.0[19]	0.77	0.46	<2	<2.16
Benzene (71-43-2)	10.0[19]	0.41	0.10	0.90	1.31
Xylene (1330-20-7)	10.0[18]	0.01	0.01	0.70	0.71
2,2,4-Trimethylpentane (540-84-1)	10.0[20]	N/D	N/A	0.50	0.50
Hydrogen Chloride (7647-01-0)	10.0[18]	N/D	N/A	0.38	0.38
Acrolein (107-02-8)	10.0[21]	0.29	0.17	0.15	0.33
Cumene (98-82-8)	10.0[18]	N/D	N/A	0.23	0.23
Ethylbenzene (100-41-4)	10.0[18]	0.01	N/D	0.09	0.10
Other individual HAPs	10.0	N/D	N/A	<0.01 each	<0.01 each

[15] OP2015-001 was chosen rather than Permits 102017-014 or 042019-015 as emissions from Permits 102017-014 and 042019-015 were included in this project due to requested increases in a number of limits taken in these permits.
[16] OP2015-001 based emissions on stack testing conducted in March 2007, while the 2018 EIQ based emissions on stack testing conducted in May 2016.
[17] The SMAL for this HAP is 9 tpy.
[18] This value also represents the SMAL for this HAP.
[19] The SMAL for this HAP is 2 tpy.
[20] The SMAL for this HAP is 5 tpy.
[21] The SMAL for this HAP is 0.04 tpy.

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

The project results in emissions increases of PM, PM_{10}, $PM_{2.5}$, and VOC above de minimis levels and of acrolein above the SMAL. There is no NAAQS promulgated for PM; therefore, PM ambient air modeling was not performed. No model is currently available which can accurately predict ambient ozone concentrations caused by this installation's VOC emissions; therefore, VOC ambient air modeling was not performed. PM_{10}, $PM_{2.5}$, and acrolein modeling was performed, refer to the Ambient Air Quality Impact Analysis section of this permit for additional information.

PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Project emissions increases of PM, PM_{10}, $PM_{2.5}$, and VOC are above de minimis levels and above the SMAL for acrolein.

APPLICABLE REQUIREMENTS

POET Biorefining – Laddonia, 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 application was approved. For a complete list of applicable requirements for your installation, please consult your operating permit.

- 10 CSR 10-6.050 *Start-Up, Shutdown, and Malfunction Conditions*

- 10 CSR 10-6.065 *Operating Permits*

- 10 CSR 10-6.070 *New Source Performance Regulations*
    - 40 CFR Part 60, Subpart Dc – *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units* applies to EP13 and EP14 Boilers.
    - 40 CFR Part 60, Subpart Kb – *Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984* applies to TK01, TK02, TK03, TK04, and TK05 Tanks.
    - 40 CFR Part 60, Subpart VVa – *Standards of Performance for Equipment Leaks for VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006* applies to FS03 and FS04 Equipment Leaks.

- 10 CSR 10-6.075 *Maximum Achievable Control Technology Regulations*
    - 40 CFR Part 63, Subpart BBBBBB – *National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Distribution Bulk*

Terminals, Bulk Plants, and Pipeline Facilities will apply if the installation uses gasoline or unleaded gasoline as their denaturant.
    - 40 CFR Part 63, Subpart CCCCCC – *National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities* applies to TK08 Gasoline Tank for Plant Vehicles.

- 10 CSR 10-6.110 *Submission of Emission Data, Emission Fees and Process Information*
    - 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.

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

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

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

AMBIENT AIR QUALITY IMPACT ANALYSIS

Ambient air quality modeling was performed using AERMOD Version 18081 to determine the ambient impact of PM_{10}, $PM_{2.5}$, and acrolein. Full impact analyses were conducted as the ambient impacts from the project exceeded the significant impact levels for each pollutant. Interactive sources were included in the full impact analyses for PM_{10} and $PM_{2.5}$. The full impact analysis for PM_{10} did indicate an exceedance of the PM_{10} NAAQS in the area; however, POET Biorefining – Laddonia, LLC's contribution to the violating receptor was below the significant impact level. The full impact analyses for $PM_{2.5}$ and acrolein indicated compliance with the standards.

Permits issued under 10 CSR 10-6.060(5) are not required to demonstrate compliance with the increment standards at the time of permitting. The Air Pollution Control Program is required to track increment consumption in baseline areas at five year intervals after the minor source baseline date has been set for the area.

Table 10: Ambient Air Quality Analysis NAAQS Results

Pollutant	Modeled Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Time Period
PM_{10}	322.32	150	24-hr
$PM_{2.5}$	30.49	35	24-hr
	10.29	12	Annual

Table 11: Ambient Air Quality Significant Impact Analysis at Violating NAAQS Receptor

Pollutant	Modeled Impact ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	Time Period
PM_{10}	2.29	5	24-hr

Table 12: Ambient Air Quality Risk Assessment Analysis Results

Pollutant	Modeled Impact (μg/m^3)	RAL (μg/m^3)	Time Period
Acrolein	2.15	6.9	24-hr
	0.02	0.02	Annual

STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (5) of 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 May 13, 2019, received May 16, 2019 designating POET Biorefining, LLC as the owner and operator of the installation.

Attachment A – Installation-wide Formaldehyde Emissions

POET Biorefining – Laddonia, LLC
Audrain County, S36, T52N, R7W
Project Number: 2019-05-015
Installation ID Number: 007-0054
Permit Number: 112020-013

Date (Month and Year):

Emission Source	Description	Monthly Throughput	Formaldehyde Emission Factor	Monthly Formaldehyde Emissions[22] (tons)
EP01	Grain Receiving & DDGS Transfer[5]	tons DDGS	3.73E-5 lb/ton DDGS[23]	
EP08	Fermentation & Distillation Processes - controlled by CE08A or CE08B Packed Bed Wet Scrubber and not by CE11 RTO	hours of RTO bypass	1.38E-2 lb/hr of RTO bypass[24]	
FERMVENT	Fermentation & Distillation Processes – Scrubber Bypass	hours of scrubber bypass	5.52E-3 lb/hr of scrubber bypass[25]	
CENTVENT	(7) Centrifuges – RTO Bypass	hours of	2.14E-4 lb/hr of RTO bypass[26]	

[22] Monthly Formaldehyde Emissions (tons) = Monthly Throughput x Formaldehyde Emission Factor x 0.0005 ton/lb.
[23] Obtained from stack testing of a similar emission source at POET – Gowrie on November 9, 2017. This emission factor shall be replaced with a site specific emission factor obtained from stack testing required by Special Condition 4 for EP11. The emission factor shall be calculated as the stack tested lb/hr formaldehyde emission rate divided by the tph DDGS transfer rate during the stack test.
[24] Obtained from stack testing conducted in May 2016 and scaled up to 1000 gpm beer. This emission rate shall be replaced with an emission rate obtained by stack testing required by Special Condition 4 for EP08 while operating the scrubbers and not venting to EP09. If production during the stack test is less than 1000 gpm beer, the stack tested emission rate shall be scaled up to 1000 gpm beer.
[25] Obtained from stack testing conducted in May 2016 and scaled up to 1000 gpm beer. This emission rate shall be replaced with an emission rate obtained by stack testing required by Special Condition 4 for EP08 while operating uncontrolled and not venting to EP09. If production during the stack test is less than 1000 gpm beer, the stack tested emission rate shall be scaled up to 1000 gpm beer.
[26] Obtained from stack testing conducted in March 2018 and scaled up to 1000 gpm beer. This emission rate shall be replaced with an emission rate obtained by stack testing required by Special Condition 4 for EP09 while operating uncontrolled. If production during the stack test is less than 1000 gpm beer, the stack tested emission rate shall be scaled up to 1000 gpm beer.

Emission Source	Description	Monthly Throughput	Formaldehyde Emission Factor	Monthly Formaldehyde Emissions[22] (tons)
WHOLE	Whole Stillage Tank – RTO Bypass	RTO bypass	3.25E-1 lb/hr of RTO bypass[27]	
OIL	Grain Oil System – RTO Bypass		4.48E-3 lb/hr of RTO bypass[28]	
EP09	Packed Bed Wet Scrubber, DDGS Fluid Bed Cooler, (2) DDGS Dryers, (7) Centrifuges, Whole Stillage Tank, & Grain Oil System – controlled by CE11 RTO	kgal beer	4.44E-4 lb/kgal beer[29]	
EP10	DDGS Fluid Bed Cooler routing exhaust air to DDGS Dryers	tons DDGS	2.16E-4 lb/ton DDGS[30]	
	DDGS Fluid Bed Cooler at full flow	hours of RTO bypass	9.73E-2 lb/hr of RTO bypass[31]	
EP11	DDGS Silo	tons DDGS	3.73E-5 lb/ton DDGS[23]	
EP12	DDGS Silo Bypass	tons DDGS	3.73E-5 lb/ton DDGS[23]	
EP13	Boiler #1	MMscf natural gas	7.5E-2 lb/MMscf natural gas[32]	
EP14	Boiler #2	MMscf natural gas	7.5E-2 lb/MMscf natural gas[32]	

[27] Based on a service temperature of 190°F, an average throughput of 194,400 gallons per hour (70,956,000 gpy) and a maximum formaldehyde concentration of 4.89 ppmw.
[28] Estimated based on an average throughput of 194,400 gallons per hour (70,956,000 gpy) using TANKS 4.0.9d.
[29] Obtained from stack testing conducted in March 2018. This emission factor shall be replaced with an emission factor obtained from stack testing required by Special Condition 4 for EP09 while the RTO and DDGS Dryers are in operation, the exhaust from the DDGS Fluid Bed Cooler is being used as combustion air in the DDGS Dryers, and no emissions are venting out of EP08. The emission factor shall be calculated as the stack tested lb/hr formaldehyde emission rate divided by the kgph beer production rate during the stack test.
[30] Obtained from stack testing conducted in May 2016 during which 83% of emissions vented to the DDGS Dryers for use as combustion air and the other 17% of emissions vented to EP10. This emission rate shall be replaced with the emission rate obtained from stack testing required by Special Condition 4 for EP10. If the DDGS production during the test is less than 30 tph, the stack tested emission rate shall be scaled up to 30 tph.
[31] Obtained from stack testing conducted in May 2016 scaling up to 30 tph DDGS and 24,855 dscfm out of EP10. This emission rate shall be replaced with the emission rate obtained from stack testing required by Special Condition 4 for EP10. If the DDGS production during the test is less than 30 tph, the stack tested emission rate shall be scaled up to 30 tph. If the exhaust flow rate out of EP10 is less than 24,855 dscfm, the stack tested emission rate shall be scaled up to 24,855 dscfm.
[32] Obtained from AP-42 Section 1.4 “Natural Gas Combustion” (July 1998).

Emission Source	Description	Monthly Throughput	Formaldehyde Emission Factor	Monthly Formaldehyde Emissions[22] (tons)
TK07	Syrup Tank	kgal syrup	3.31E-5 lb/kgal syrup[33]	
FS03 Fermentation & Distillation Processes Equipment Leaks[34]				4.05E-6
FS05	Wet Cake Storage	tons wet cake	9.98E-3 lb/ton wet cake[35]	
FS06	DDGS Flat Storage	tons DDGS	3.73E-5 lb/ton DDGS[23]	
FS07	DDGS Loadout	tons DDGS	3.73E-5 lb/ton DDGS[23]	
FS08	Syrup & Grain Oil Loadout	kgal syrup	4.03E-2 lb/kgal syrup[36]	
		tons grain oil	1.48E-4 lb/ton grain oil[37]	
Installation Monthly Formaldehyde Emissions[38] (tons):				
Installation 12-Month Rolling Total Formaldehyde Emissions[39] (tons):				

[33] Based on a service temperature of 190°F and a maximum formaldehyde concentration of 4.04 ppmw.
[34] Based on 7 pump seals in heavy liquid service, 140 valves in heavy liquid service, 2 gas valves, 2 open ended lines, and 450 connectors associated with the fermentation process (max VOC content = 20%) and 11 pump seals in light liquid service, 275 valves in light liquid service, 50 gas valves, 11 relief valves, and 1300 connectors associated with the distillation process (max VOC content = 100%). Emission factors and LDAR control efficiencies were obtained from "Protocol for Equipment Leak Emission Estimates" (November 1995).
[35] Based on chemical analyses of wet cake and thin stillage indicating 4.99 mg formaldehyde/kg wetcake.
[36] Based on a maximum formaldehyde concentration of 4.04 ppmw.
[37] Based on a maximum formaldehyde concentration of 56.86 ppbw.
[38] Installation Monthly Formaldehyde Emissions (tons) = the sum of each emission sources' Monthly Formaldehyde Emissions (tons).
[39] Installation 12-Month Rolling Total Formaldehyde Emissions = the sum of the 12 most recent Installation Monthly Formaldehyde Emissions (tons). **12-Month Rolling Total Formaldehyde Emissions of less than 2.16 tons indicates compliance with Special Condition 2.D.**

APPENDIX A

Abbreviations and Acronyms

% .... percent
ºF .... 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
kgph .... 1,000 gallons per hour
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
SSM .... Startup, Shutdown & Malfunction
tph .... tons per hour
tpy .... tons per year
VMT .... vehicle miles traveled
VOC .... Volatile Organic Compound