Lane Regional Air Protection Agency
Simple Air Contaminant Discharge Permit

<u>Review Report</u>

OR-CAL, Inc. **Permit No. 206131**
29454 Meadowview Road
Junction City, Oregon 97448
https://orcalinc.com/

Source Information:

Primary SIC	2879 – Pesticides and Agricultural Chemicals
NAICS	325320 – Pesticide and Other Agricultural Chemical Manufacturing
Source	B.55 – Pesticide manufacturing

Categories (LRAPA title 37, Table 1)	5,000 or more tons/year annual production.
Public Notice Category	III

Compliance and Emissions Monitoring Requirements:

Unassigned Emissions	N
Emission Credits	N
Compliance Schedule	N
Source Test [date(s)]	N

COMS	N
CEMS	N
Ambient monitoring	N

Reporting Requirements

Annual Report (due date)	2/15
Semi-Annual Report (due date)	N
GHG Report (due date)	N
Monthly Report (due date)	N

Quarterly Report (due date)	N
Excess Emissions Report	Y
Other Reports (due date)	N

Air Programs

NSPS (list subparts)	N
NESHAP (list subparts)	N
CAM	N
Regional Haze (RH)	N
TACT	N
40 CFR Part 68 Risk Management	N
Synthetic Minor (SM)	N
SM-80	N
Title V	N

Major FHAP Source	N
Federal Major Source	N
Type A State New Source Review	
Type B State New Source Review	
Prevention of Significant Deterioration (PSD)	N
Nonattainment New Source Review (NNSR)	N

Permittee Identification

1. OR-CAL, Inc. ("OR-CAL" and/or "the facility") operates an agricultural chemical manufacturing facility at 29454 Meadowview Road in Junction City, Oregon.

General Background Information

2. OR-CAL operates four (4) separate production lines at this location for batch production of liquid products.

   Production Line 1 is used to produce suspension concentrates. There are three (3) mix tanks (Emission Units K1, K2, and K3) on this production line. Raw materials (powder and liquid) are loaded into the tanks through access hatches that are only opened for loading raw materials and period checks on equipment and product during operation. The finished product is packaged directly from the production tank through a closed system.

   Production Line 2 is used to produce non-pesticide crop protectants. Raw material (powder) is mechanically conveyed from the storage silo (Emission Unit S1) to the mix tank (Emission Unit M1), where it is combined with water and other raw materials (both powder and liquid). Once mixed, the product is transferred to a holding tank (Emission Unit T7). The finished product is stored in one (1) of two (2) tanks (Emission Units T4B and T8). Approximately 20 percent of the product packaging is done in an open system, the rest is done in a closed system. Losses (i.e., air emissions) are accounted for in the open system, but not the closed system.

   Production Line 3 is used to produce the pesticide product Lime Sulfur. Raw material (powder) is mechanically conveyed from the storage silo (Emission Unit S2) to kettle K5, where it is combined with water and other raw materials (both powder and liquid). Kettle K5 is heated with steam from a natural gas boiler. Once cooled, the solid byproduct is separated from the liquid product, and the liquid product is transferred to one (1) of the seven (7) storage tanks. The solid byproduct is dewatered and shipped offsite.

   Production Line 4 is used to produce dilute solutions of pesticide products. Concentrated solutions are mixed with other ingredients and the final product is stored in holding tank T2B. No emissions are assessed from this production line.

   The facility has a natural gas-fired Parker boiler, with a maximum heat input rating of 2.1 MMBtu per hour, that generates steam for kettle K5 and Production Line 3. The facility also has eight (8) natural gas-fired area heaters. Four (4) have maximum heat input ratings of 0.2 MMBtu per hour each, and four (4) have maximum heat input ratings of 0.125 MMBtu/hr each. The area heaters would normally be considered Categorically Insignificant Activities (CIA). However, because the facility does not have a separate gas meter for the boiler, they have elected to consider all natural gas combustion as a significant emission unit.

Reasons for Permit Action and Fee Basis

3. This permit action is for the initial issuance of a Simple Air Contaminant Discharge Permit (ACDP). LRAPA had previously visited the facility in 2011 and determined that they did not require an air permit. LRAPA subsequently visited the facility in 2022 and determined that the facility had exceeded the threshold under Title 37, Table 1, Part B: 55 of 5,000 or more tons per year annual production of pesticide.

Attainment Status

4. The facility is located in an area that has been designated as attainment or unclassified for all criteria pollutants. The facility is outside the Eugene-Springfield UGB as defined in LRAPA 29-0010 which designates the Eugene-Springfield CO and PM_{10} maintenance areas. The facility is

also located outside the Eugene-Springfield UGB as described in the current Eugene-Springfield Metropolitan Area General Plan, as amended.

Permitting History

5. LRAPA has reviewed and issued the following permitting actions to this facility:

Date(s) Approved/Valid	Permit Action Type	Description
Upon Issuance	Simple ACDP	Initial permit.

Compliance History

6. This facility has not been inspected by LRAPA since the facility was constructed in 2013.

7. LRAPA has not issued any violation notices and/or taken enforcement action against this facility since it was constructed in 2013.

Source Testing

8. The facility is not required to conduct source testing at this time. LRAPA is not aware of any historical source testing conducted at this facility.

Emission Unit Descriptions

9. The emission units (EUs) regulated by this permit are the following:

Emission Unit ID	Emission Unit Description	Pollution Control Device (PCD ID)	Pollution Control Device Description	Installed / Last Modified
Production Line 1				
K1	Production Line 1 – Mix Tank K1	--	NA	2013
K2	Production Line 1 – Mix Tank K2	--	NA	2013
K3	Production Line 1 – Mix Tank K3	--	NA	2013
Production Line 2				
S1	Production Line 2 – Storage Silo	BV2	Bin Vent	2013
M1	Production Line 2 – Mix Tank	--	NA	2013
T7	Production Line 2 – Hold Tank T7	--	NA	2014
T8	Production Line 2 – Storage Tank T8	--	NA	2014
T4B	Production Line 2 – Storage Tank T4B	--	NA	2014
P2	Production Line 2 – Packaging	--	NA	2013
Production Line 3				
S2	Production Line 3 – Storage Silo	BV3	Bin Vent	2013
Facility Wide Natural Gas				
NG	Facility Wide Natural Gas	--	NA	2013

Significant Emission Units

10. Production Line 1

The VOC, hazardous air pollutant and toxic air contaminant emissions from Emission Units K1, K2, and K3 are calculated using the methodology from EPA's Emission Inventory Improvement Program, Methods or Estimating Emissions from Chemical Manufacturing Facilities (August

2007) – Section 3.7. For calculating VOC emissions, the facility has assumed the properties of the VOC constituent with the highest vapor pressure are representative as the VOC content of the mixture for simplicity.

11. Production Line 2
The VOC emissions from Emission Units T7, T8, and T4B are calculated using equations in EPA, AP-42, Section 7.1 – Organic Liquid Storage. The facility has assumed the properties of the predominant VOC constituent are representative as the VOC content of the mixture for simplicity. The predominant VOC constituent also has the highest vapor pressure. The VOC emissions from Emission Unit M1 are calculated using the methodology from EPA's Emission Inventory Improvement Program, Methods or Estimating Emissions from Chemical Manufacturing Facilities (August 2007) – Section 3.7. The facility has assumed the properties of the predominant VOC constituent are representative as the VOC content of the mixture for simplicity. The predominant VOC constituent also has the highest vapor pressure. The VOC emissions from Emission Unit P2 are calculated using the methodology from EPA's Emission Inventory Improvement Program, Methods or Estimating Emissions from Chemical Manufacturing Facilities (August 2007) – Section 3.1. For calculating VOC emissions, the facility has assumed the properties of the VOC constituent with the highest vapor pressure are representative as the VOC content of the mixture for simplicity. The particulate matter emissions from Emission Unit S1 assume a constant exit grain loading from the silo bin vents, a constant air flow during silo loading, and a maximum number of hours of silo loading. The facility believes that the bin vents are inherent process equipment, but LRAPA has not acted on this assertion as of the preparation of this review report.

12. Production Line 3
The particulate matter emissions from Emission Unit S2 assume a constant exit grain loading from the silo bin vents, a constant air flow during silo loading, and a maximum number of hours of silo loading. The facility believes that the bin vents are inherent process equipment, but LRAPA has not acted on this assertion as of the preparation of this review report.

13. Facility Wide Natural Gas
The emissions from natural gas combustion are based on emission factors from Oregon DEQ AQEF05 (8/2011) and the equations from EPA 40 CFR 98 Subpart C. Hazardous air pollutant and toxic air contaminant emission factors are from DEQ 2020 Air Toxics Emission Inventory Combustion Emission Factor Tool.

Nuisance, Deposition and Other Emission Limitations

14. Under LRAPA 49-010(1), the permittee must not cause or allow air contaminants from any source subject to regulation by LRAPA to cause a nuisance. Compliance is demonstrated through documentation of all complaints received by the facility from the general public and following procedures to notify LRAPA of receipt of these complaints.

15. Under LRAPA 32-055, the permittee must not cause or permit the emission of particulate matter which is larger than 250 microns in size at sufficient duration or quantity as to create an observable deposition upon the real property of another person. Compliance is demonstrated through documentation of all complaints received by the facility from the general public and following procedures to notify LRAPA of receipt of these complaints.

16. Under LRAPA 32-090(1), the permittee must not discharge from any source whatsoever such quantities of air contaminants which cause injury or damage to any persons, the public, business or property; such determination is to be made by LRAPA. Compliance is demonstrated through documentation of all complaints received by the facility from the general public and following procedures to notify LRAPA of receipt of these complaints.

Emission Limitations

17. The facility is subject to the visible emission limitations under LRAPA 32-010(3). For sources, other than wood-fired boilers, no person may emit or allow to be emitted any visible emissions that equal or exceed an average of 20 percent opacity for a period or periods aggregating more than three (3) minutes in any one (1) hour. Compliance is demonstrated through a plant survey of visible emissions using EPA Method 22 to be completed at least once a quarter. The permittee is required to take corrective action if any visible emissions are identified or conduct a Modified EPA Method 9 test if the visible emissions cannot be eliminated. In addition, the permittee must prepare and maintain an Operation & Maintenance Plan for all particulate matter emission control devices at the facility.

18. The non-fuel burning equipment at this source that emit particulate matter are subject to the following particulate matter emission limitations under LRAPA 32-015(2)(b)(B): For sources installed, constructed, or modified on or after June 1, 1970 but prior to April 16, 2015 for which there are no representative compliance source test results, the particulate matter emission limit is 0.14 grains per dry standard cubic foot. Compliance is demonstrated through a plant survey of visible emissions using EPA Method 22 to be completed at least once a quarter. The permittee is required to take corrective action if any visible emissions are identified or conduct a Modified EPA Method 9 test if the visible emissions cannot be eliminated. In addition, the permittee must prepare and maintain an Operation & Maintenance Plan for all particulate matter emission control devices at the facility.

19. The fuel burning equipment at this source that emit particulate matter are subject to the following particulate matter emission limitations under LRAPA 32-030(1)(b): For sources installed, constructed or modified on or after June 1, 1970 but prior to April 16, 2015, for which there are no representative compliance source test results prior to April 16, 2015, the permittee must not cause, suffer, allow, or permit particulate matter emissions in excess of 0.14 grains per dry standard cubic foot. Compliance is demonstrated through a plant survey of visible emissions using EPA Method 22 to be completed at least once a quarter. The permittee is required to take corrective action if any visible emissions are identified or conduct a Modified EPA Method 9 test if the visible emissions cannot be eliminated. In addition, the permittee must prepare and maintain an Operation & Maintenance Plan for all particulate matter emission control devices at the facility.

20. Emission Units S1 and S2 are subject to the process weight rate emission limitations under LRAPA 32-045(1). No person may cause, suffer, allow, or permit the emissions of particulate matter in any one (1) hour from any process in excess of the amount shown in LRAPA 32-8010, for the process weight rate allocated to such process. Process weight is the total weight of all materials introduced into a piece of process equipment. Liquid and gaseous fuels and combustion air are not included in the total weight of all materials. Compliance is demonstrated through a plant survey of visible emissions using EPA Method 22 to be completed at least once a quarter. The permittee is required to take corrective action if any visible emissions are identified or conduct a Modified EPA Method 9 test if the visible emissions cannot be eliminated. In addition, the permittee must prepare and maintain an Operation & Maintenance Plan for all particulate matter emission control devices at the facility.

21. The control equipment at the facility must be operated and maintained at the highest and best practicable treatment and control of air contaminant emissions so as to maintain overall air quality at the highest possible levels, and to maintain contaminant concentrations, visibility reduction, odors, soiling, and other deleterious factors at the lowest possible levels under LRAPA 32-005(1). Compliance for the control equipment at the facility will be demonstrated through implementation of an Operation & Maintenance Plan.

Typically Achievable Control Technology (TACT)

22. All emission units at this facility were installed after 1994. LRAPA 32-008(2) requires new units installed or existing emission units modified on or after January 1, 1994, meet TACT if the emission unit meets the following criteria: The emission unit is not subject to Major NSR in title 38, Type A State NSR in LRAPA title 38, an applicable Standard of Performance for New Stationary Sources in title 46, or any other standard applicable only to new or modified sources in title 32, title 33, or title 39 for the regulated pollutant emitted; the source is required to have a permit; if new, the emission unit has emissions of any criteria pollutant equal to or greater than one (1) ton per year of any criteria pollutant; if modified, the emission unit would have an increase in emissions of any criteria pollutant equal to or greater than one (1) ton per year of any criteria pollutant; and LRAPA determines that the proposed air pollution control devices and emission reduction processes do not represent TACT.
    - 22.a. The following emission units are not subject to TACT because they do not have potential emissions of criteria pollutants equal to or greater than one (1) ton per year: K1, S1, T7, T8, T4B, P2, S2, and NG.
    - 22.b. The following emission unit are subject to TACT because they have potential emissions of criteria pollutants equal to or greater than one (1) ton per year: K2, K3, and M1. For the purposes of TACT applicability, the facility has conservatively calculated emissions to assume production is occurring in open top vessels assumed the properties of the VOC constituent with the highest vapor pressure are representative as the VOC content of the mixture. While a formal TACT analysis has not been conducted, TACT for these emission units would likely be a requirement that each of these emission units be equipped with a cover or lid that must be closed at all times when they are in operation, except for manual operations that require access, such as material addition and removal, inspection, sampling and cleaning. Controls are not considered economically feasible for these emission units at the calculated potential emission rates.

<u>Plant Site Emission Limits (PSELs)</u>

23. Provided below is a summary of the baseline emissions rate, netting basis, and PSELs for this facility.

Pollutant	Baseline Emission Rate (TPY)	Netting Basis	Plant Site Emission Limit (PSEL)	PSEL Increase Over Netting Basis (TPY)	Significant Emission Rate (TPY)
		Proposed (TPY)	Proposed (TPY)		
PM	NA	0	De minimis	NA	25
PM_{10}	NA	0	De minimis	NA	15
$PM_{2.5}$	NA	0	De minimis	NA	10
CO	NA	0	1.2	1.2	100
NO_X	NA	0	1.5	1.5	40
SO_2	NA	0	De minimis	NA	40
VOC	NA	0	8.1	8.1	40
GHG (CO_2 eq)	NA	0	De minimis	NA	75,000

- 23.a. The facility does not have a baseline emission rate for PM, PM_{10}, CO, NO_X, SO_2 or VOC because the facility was not in operation during either the 1977 or 1978 baseline year. A baseline emission rate is not established for $PM_{2.5}$ in accordance with LRAPA 42-0048(3). The facility has no baseline for GHGs because the facility did not request a baseline for this pollutant.
- 23.b. The netting basis for all pollutants is 0 (zero) in accordance with LRAPA 42-0046(4).
- 23.c. In accordance with OAR 340-222-0041(2), the PSELs for CO, NO_X, and VOC are set equal to the source's potential to emit. No PSELs are set for PM, PM_{10}, $PM_{2.5}$, SO_2 and

GHGs in accordance with LRAPA 42-0020(3)(a) because these pollutants are emitted below the de minimis as defined in LRAPA title 12.

Unassigned Emissions and Emission Reduction Credits

24. The facility has zero (0) unassigned emissions. Unassigned emissions are equal to the netting basis minus the source's current PTE, minus any banked emission reduction credits. The facility has zero (0) tons of emission reduction credits.

New Source Review (NSR) and Prevention of Significant Deterioration (PSD)

25. This source is located in an area that is designated attainment or unclassified for all regulated pollutants. The proposed PSELs are less than the federal major source threshold for non-listed sources of 250 TPY per regulated pollutant and are not subject to Major NSR.

Federal Hazardous Air Pollutants/Toxic Air Contaminants

26. Potential annual federal hazardous air pollutant emissions (HAP) are based on the potential to emit of the facility operating under permit limitations. The potential emissions of federal HAPs are below the major source thresholds of 10 TPY of any single federal HAP and 25 TPY for the aggregate of federal HAPs. The maximum potential emission of a single federal HAP is 0.037 tons per year (acetaldehyde). The potential aggregate of federal HAP emissions are 0.040 tons per year. The facility is considered a natural minor or area source of federal HAPs.

27. Under the Cleaner Air Oregon (CAO) program, only existing sources that have been notified by LRAPA and new sources are required to perform risk assessments. This source has not been notified by LRAPA and is, therefore, not yet required to perform a risk assessment or report annual emissions of toxic air contaminants (TAC). LRAPA required reporting of approximately 600 toxic air contaminants in 2016 and regulates approximately 260 toxic air contaminants that have Risk Based Concentrations established in the rule. All federal HAPs are on the list of approximately 600 toxic air contaminants. After the source is notified by LRAPA, they must update their inventory and perform a risk assessment to see if they must reduce risk from their toxic air contaminant emissions. Until then, sources will be required to report toxic air contaminant emissions triennially.

28. Provided below is a summary of the potential emissions of federal HAPs and CAO TACs from this facility.

Pollutant	CAS/DEQ Number	Potential Emissions (TPY)	Federal HAP	CAO Air Toxic
Organics				
Acetaldehyde	75-07-0	3.7E-02	Y	Y
Acrolein	107-02-8	3.9E-05	Y	Y
Benzene	71-43-2	1.1E-03	Y	Y
Ethyl benzene	100-41-4	1.4E-04	Y	Y
Formaldehyde	50-00-0	2.5E-04	Y	Y
Hexane	110-54-3	9.1E-05	Y	Y
Toluene	108-88-3	5.3E-04	Y	Y
Xylenes	1330-20-7	3.9E-04	Y	Y
Polycyclic aromatic hydrocarbons (PAHs)	401	1.5E-06	Y	Y
Benzo(a)pyrene	50-32-8	1.7E-08	Y	Y
Naphthalene	91-20-3	4.4E-06	Y	Y
Metals				

Pollutant	CAS/DEQ Number	Potential Emissions (TPY)	Federal HAP	CAO Air Toxic
Arsenic and compounds	7440-38-2	2.9E-06	Y	Y
Beryllium and Compounds	7440-41-7	1.7E-07	Y	Y
Cadmium and compounds	7440-43-9	1.6E-05	Y	Y
Chromium and compounds	7440-47-3	2.0E-05	Y	Y
Cobalt and compounds	7440-48-4	1.2E-06	Y	Y
Manganese and compounds	7439-96-5	5.5E-06	Y	Y
Mercury and compounds	7439-97-6	3.8E-06	Y	Y
Nickel and compounds	7440-02-0	3.0E-05	Y	Y
Selenium and compounds	7782-49-2	3.5E-07	Y	Y

Toxics Release Inventory

29. The Toxics Release Inventory (TRI) is a federal program that tracks the management of certain toxic chemicals that may pose a threat to human health and the environment, over which LRAPA has no regulatory authority. It is a resource for learning about toxic chemical releases and pollution prevention activities reported by certain industrial facilities. Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) created the TRI program. In general, chemicals covered by the TRI program are those that cause:
    - Cancer or other chronic human health effects;
    - Significant adverse acute human health effects; or
    - Significant adverse environmental effects.

    There are currently over 650 chemicals covered by the TRI program. Facilities that manufacture, process or otherwise use these chemicals in amounts above established levels must submit annual TRI reports on each chemical. NOTE: The TRI program is a federal program over which LRAPA has no regulatory authority. LRAPA does not guarantee the accuracy of any information copied from EPA's TRI website.

    In order to report emissions to the TRI program, a facility must operate under a reportable NAICS code, meet a minimum employee threshold, and manufacture, process, or otherwise use chemicals in excess of the applicable reporting threshold for the chemical. For the calendar year 2022, this facility did not report to the TRI program.

New Source Performance Standards (NSPSs)

30. There are no emission units at this facility for which NSPS have been promulgated or are applicable. LRAPA reviewed the following NSPS to determine their applicability to this facility:
    - 30.a. 40 CFR 60 subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984 is not applicable because the capacity of the storage tanks at this facility are below the applicability threshold of 75 m^3 (19,812.9 gallons).
    - 30.b. 40 CFR 60 subpart VV and VVa – Standards of Performance for Equipment Leaks of Volatile Organic Compounds in the Synthetic Organic Chemical Manufacturing Industry (SOCMI) is not applicable to this facility because the facility does not produce as intermediates or final products any of the chemicals listed in 40 CFR 60.489.
    - 30.c. 40 CFR 60 subpart III – Standards of Performance for Volatile Organic Compound Emissions from the SOCMI Air Oxidation Unit Processes is not applicable to this facility because the facility does not produce any of the chemicals listed in 40 CFR 60.617 as a product, co-product, by-product, or intermediate.

30.d. 40 CFR 60 subpart NNN – Standards of Performance for Volatile Organic Compound Emissions from SOCMI Distillation Operations is not applicable to this facility because the facility does not produce any of the chemicals listed in 40 CFR 60.667 as a product, co-product, by-product, or intermediate.

30.e. 40 CFR 60 subpart RRR – Standards of Performance for Volatile Organic Compound Emissions from SOCMI Reactor Processes is not applicable to this facility because the facility does not produce any of the chemicals listed in 40 CFR 60.707 as a product, co-product, by-product, or intermediate.

National Emission Standards for Hazardous Air Pollutants (NESHAPs)

31. There are no emission units at this facility for which NESHAPs are applicable. LRAPA reviewed the following NESHAPs to determine their applicability to this facility:

31.a. 40 CFR 63 subpart VVVVVV(6V) - National Emission Standards for Hazardous Air Pollutants for Chemical Manufacturing Area Sources is not applicable to this facility. This regulation applies to the owners or operators of a chemical manufacturing process unit (CMPU) at an area source and for which the HAP listed in Table 1 to 40 CFR 63 subpart 6V are present in the CMPU as specified in 40 CFR 63.11494(2)(i) through (iv). The facility has reviewed these criteria and stated that they are not subject to this NESHAP.

31.b. 40 CFR 63 subpart BBBBBBB(7B) – National Emission Standards for Hazardous Air Pollutants for Area Sources: Chemical Preparations Industry is not applicable to this facility because the facility does not have any process operations described by the NAICS code 325998. The facility is covered by NAICS code 325320.

Recordkeeping Requirements

32. The facility is required to keep and maintain a record of the following information for a period of at least five (5) years.

Activity	Parameter	Units	Minimum Recording Frequency
PSEL Recordkeeping			
Production Line 1	Production Rate	Gallon	Monthly
Production Line 2 Production	Production Rate	Gallon	Monthly
Production Line 2 Packaging	Packaging Rate	Gallon	Monthly
Facility-wide natural gas	Usage	MMCF	Monthly
General Recordkeeping			
Log of nuisance complaints	Not Applicable	Not Applicable	Upon receipt of complaint
Visible Emission Survey	Not Applicable	Not Applicable	Quarterly
Operation and Maintenance Plan	Not Applicable	Not Applicable	Maintain current version on-site
Upset log of all planned and unplanned excess emissions, as required by Condition G16 of the permit	Not Applicable	Not Applicable	Per occurrence

Reporting Requirements

33. The facility must submit to LRAPA the following reports by no later than the dates indicated in the table below:

Report	Reporting Period	Due Date
PSEL pollutant emissions as calculated according to Conditions 5 and 6 of the permit, including the supporting process information.	Annual	February 15
A summary of maintenance and repairs performed on any pollution control devices at the facility.	Annual	February 15
A summary of all complaints received by the permittee and their resolution as required by Condition G11 of the permit.	Annual	February 15
The upset log required by Condition G14 of the permit, if any planned or unplanned excess emissions have occurred during the reporting period.	Annual	February 15

34. The permittee is not subject to greenhouse gas reporting under OAR 340 Division 215 because actual greenhouse gas emissions are less than 2,500 metric tons (2,756 short tons) of CO_2 equivalents per year. If the source ever emits more than this amount, they will be required to report greenhouse gas emissions.

Public Notice

35. Pursuant to OAR 340-216-0064(5)(a), which became effective on March 1, 2023, issuance of a renewed Simple Air Contaminant Discharge Permit requires public notice in accordance with OAR 340-209-0030(3)(c) [aka LRAPA 31-0030(3)(c)], which requires LRAPA to provide notice of the proposed permit action and a minimum of 35 days for interested persons to submit written comments.

    The draft permit was on public notice from March 1, 2024 to April 5, 2024. No comments were submitted during the 35-day comment period.

JJW/RR
04/08/2024

Emission Detail Sheets:

Table 1
Input Process Rates and Parameters
OR-CAL, Inc.—Junction City, Oregon

Parameter	Hourly Parameter			Daily Parameter			Annual Parameter		
	Proposed Production or Throughput Rate								
Facility-Wide									
Facility Hours of Operation	--			24.0	(hrs/day)	(1)	8,760	(hrs/yr)	(1)
Raw Material Silos									
Production Line 2 Silo Filling Hours of Operation	--			6.00	(hrs/day)	(2)	1,144	(hrs/yr)	(1)
Production Line 3 Silo Filling Hours of Operation	--			2.00	(hrs/day)	(2)	208	(hrs/yr)	(1)
Facility Production									
Line 1 Production Rate	--		(3)	1,600	(gal/day)	(1)	582,300	(gal/yr)	(1)
Line 2 Production Rate	--		(3)	10,960	(gal/day)	(1)	4,000,400	(gal/yr)	(1)
Line 3 Production Rate	--		(3)	10,000	(gal/day)	(1)	3,650,000	(gal/yr)	(1)
Line 4 Production Rate	--		(3)	18,000	(gal/day)	(1)	3,753,300	(gal/yr)	(1)
Line 2 Packaging									
Line 2 Product Packaging Rate	2,500	(gal/hr)	(1)	--			2,000,200	(gal/yr)	(4)
Natural Gas Combustion Devices									
Boiler Natural Gas Heat Input	2.10	(MMBtu/hr)	(1)	50.4	(MMBtu/day)	(a)	18,396	(MMBtu/yr)	(b)
Boiler Natural Gas Usage	2.0E-03	(MMscf/hr)	(c)	0.049	(MMscf/day)	(a)	17.9	(MMscf/yr)	(b)
Area Heaters Natural Gas Heat Input	1.30	(MMBtu/hr)	(1)	31.2	(MMBtu/day)	(a)	11,388	(MMBtu/yr)	(b)
Area Heaters Natural Gas Usage	1.3E-03	(MMscf/hr)	(c)	0.030	(MMscf/day)	(a)	11.1	(MMscf/yr)	(b)

All notes and references are provided on the following page. See Table 1 (Continued), Input Process Rates and Parameters.

Table 1 (Continued)
Input Process Rates and Parameters
OR-CAL, Inc.—Junction City, Oregon

Notes

gal = gallon.
hr = hour.
MMBtu = million British thermal units.
MMscf = million standard cubic feet.
yr = year.
[a] Daily parameter ("unit"/day) = (hourly parameter ["unit"/hr]) x (daily facility hours of operation [hrs/day])
[b] Annual parameter ("unit"/yr) = (hourly parameter ["unit"/hr]) x (annual facility hours of operation [hrs/yr])
[c] Hourly natural gas usage (MMscf/hr) = (hourly natural gas heat input [MMBtu/hr]) / (default natural gas high heat value [MMBtu/MMscf])

Default natural gas high heat value (MMBtu/MMscf) = 1,026 (5)

References

[1] Information provided by OR-CAL, Inc.
[2] Information provided by OR-CAL, Inc. Estimate average fill time of 2 hours.
[3] Production through batch process. Batch duration greater than 1 hour.
[4] Information provided by OR-CAL, Inc. Conservatively assume 50 percent of total annual Line 2 product is packaged in the open system.
[5] 40 CFR Part 98 Subpart C, Table C-1, "Default CO_2 Emission Factors and High Heat Values for Various Types of Fuel."

Table 2
Storage Tanks—Input Assumptions and Parameters
OR-CAL, Inc.—Junction City, Oregon

Tank ID	Number of Tanks	Tank Heated? [1] (Yes/No)	Tank Temp. [2] (°F)	Tank Information				Emissions Controlled or Fugitive [1]	Tank Dimensions [1]		Maximum Liquid Height [3] (ft)	Tank Size [a] (gal/tank)	Product Throughput	
				Physical Parameter [1]										
				Roof Type	Orientation	Paint Shade	Tank Condition		Diameter (ft)	Height (ft)			Daily (gal/day)	Annual (gal/yr)
Production Line 2														
T7 (Hold Tank)	1	No	77.0	FR	Vertical	White	Average	Fugitive	7.0	7.1	6.1	1,756	10,960 [4]	4,000,400 [5]
T8 (Storage Tank)	1	No	77.0	FR	Vertical	White	Average	Fugitive	10.0	21.0	20.0	11,750	11,750 [6]	2,260,820 [b]
T4B (Storage Tank)	1	No	77.0	FR	Vertical	White	Average	Fugitive	9.0	20.0	19.0	9,041	9,041 [6]	1,739,580 [b]

Notes

°F = degrees Fahrenheit.
ft = feet.
ft^3 = cubic feet.
FR = fixed-roof tank type.
gal = gallon.
hr = hour.
lb = pound.
yr= year.
[a] Tank size (gal/tank) = π/4 x (diameter of tank [ft])^2 x (maximum liquid height [ft]) x (7.48 gal/ft^3)
[b] Annual product throughput (gal/yr) = (annual product production [gal/yr]) x (tank capacity [gal]) / (total storage capacity [gal])

Annual Liquid Calcium production (gal/yr) = 4,000,400 (5)

References

[1] Information provided by OR-CAL, Inc.
[2] Assumes standard ambient temperature of 25°C (77°F) since the storage tanks are not heated.
[3] AP-42 Chapter 7 (June 2020); see equation 1-36 notes. For vertical tanks, value is set to one minus the tank shell height.
[4] See Table 1, Input Process Rates and Parameters. Assume maximum daily throughput equal to total daily production rate.
[5] See Table 1, Input Process Rates and Parameters.
[6] Maximum daily throughput assumed to be equal to tank capacity.

Table 3
Production Mix Tanks—Input Assumptions and Parameters
OR-CAL, Inc.—Junction City, Oregon

Tank ID	Number of Tanks	Tank Heated? [1] (Yes/No)	Tank Temp. [2] (°F)	Emissions Controlled or Fugitive [1]	Tank Properties [1]			Production Parameters	
					Diameter (ft)	Tank Capacity (gal/tank)	Operating Volume (gal/tank)	Duration of Operation [3] (hrs/batch)	Annual Batches [1] (batches/yr)
Production Line 2									
M1 (Mix Tank)	1	No	77.0	Fugitive	7.50	2,111	1,370	3.00	2,920
Production Line 1									
K1 (Mix Tank 1)	1	No	77.0	Fugitive	3.83	242	105	5.00	730
K2 (Mix Tank 2)	1	No	77.0	Fugitive	5.00	734	402	5.00	730
K3 (Mix Tank 3)	1	No	77.0	Fugitive	5.50	1,207	798	5.00	730

Notes

°F = degrees Fahrenheit.
ft = feet.
gal = gallon.
hr = hour.
yr= year.

References

(1) Information provided by OR-CAL, Inc.
(2) Assumes standard ambient temperature of 25°C (77°F) since the tanks are not heated.
(3) Information provided by OR-CAL, Inc. Represents maximum duration of operation.

Table 4
Raw Material Storage Silos PM Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Parameter		Production Line 2 Silo	Production Line 3 Silo
Annual Silo Fill Hours (hrs/yr)	(1)	1,144	208

Pollutant	Emission Rate (lb/hr)		Emission Estimates				Total Emission Estimates	
			Production Line 2 Silo		Production Line 3 Silo			
			Hourly [(a)] (lb/hr)	Annual [(b)] (tons/yr)	Hourly [(a)] (lb/hr)	Annual [(b)] (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)
PM	0.21	(c)	0.21	0.12	0.21	0.021	0.41	0.14
PM_{10}	0.21	(4)	0.21	0.12	0.21	0.021	0.41	0.14
$PM_{2.5}$	0.21	(4)	0.21	0.12	0.21	0.021	0.41	0.14

Notes

cfm = cubic feet per minute.
dscf = dry standard cubic feet.
gr = grain.
hr = hour.
lb = pound.
min = minute.
PM = particulate matter.
yr = year.

(a) Hourly emissions estimate (lb/hr) = (emission rate [lb/hr])
(b) Annual emissions estimate (tons/yr) = (emission rate [lb/hr]) x (annual silo fill hours [hrs/yr]) x (tons/2,000 lb)
(c) PM emission rate (lb/hr) = (grain loading [gr/dscf]) x (air flow [cfm]) x (lb/7,000 gr) x (60 min/hr)

Grain loading (gr/dscf) =	0.02	(2)
Air flow during silo loading (cfm) =	1,200	(3)

References

(1) See Table 1, Input Process Rates and Parameters.
(2) Donaldson Company, Inc. emissions statement for filter media. Filter media has an av erage emissions lev el of no more than 0.002 grains per dry standard cubic foot. Conserv ativ ely assume 10 times this for the maximum emissions lev el.
(3) Information prov ided by OR-CAL, Inc.
(4) Assumes 100% of PM is equal to $PM_{2.5}$.

Table 5
Production Line 2 Hold Tank T7 VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Parameter		(Units)	Production Line 2	AP-42 Variable
PRODUCTION VALUES				
Storage Tank ID	(1)	--	T7 (Hold Tank)	--
Total Number of Storage Tanks	(1)	--		--
Total Annual Throughput	(1)	(gal/yr)	4,000,400	--
Total Annual Throughput	(a)	(bbl/yr)	95,248	Q
Maximum Daily Throughput	(1)	(gal/day)	10,960	--
Maximum Daily Throughput	(a)	(bbl/day)	261	--
Annual Days of Operation	(2)	(days/yr)	365	--
TANK PROPERTIES				
Tank Type (Fixed Roof or Internal Floating Roof Tank)	(1)	--	Fixed Roof	--
Heated or Non-heated?	(1)	--	Non-Heated	--
Controlled or Fugitive?	(1)	--	Fugitive	--
Control Efficiency	(1)	(%)	0	--
Tank Roof Color	(1)	--	White	--
Tank Roof Condition	(1)	--	Average	--
Tank Shell Color	(1)	--	White	--
Tank Shell Condition	(1)	--	Average	--
Horizontal or Vertical	(1)	--	Vertical	--
Tank Diameter	(1)	(ft)	7.00	D
Tank Shell Height	(1)	(ft)	7.10	H_S
Roof Type	(3)	--	Dome	--
Maximum Liquid Height	(1)	(ft)	6.10	H_{LX}
Minimum Liquid Height	(4)	(ft)	1.00	H_{LN}
TANK CONTENT PROPERTIES				
Liquid Temperature	(1)	(°F)	77.0	T
Liquid Molecular Weight	(5)	(lb/lb-mole)	46.1	M_L
Vapor Molecular Weight	(5)	(lb/lb-mole)	46.1	M_V
True Vapor Pressure	(b)	(psia)	1.14	P_{VA}
ENVIRONMENTAL FACTORS				
Average Daily Maximum Ambient Temperature	(8)	(°R)	522	T_{AX}
Average Daily Minimum Ambient Temperature	(8)	(°R)	502	T_{AN}
Average Daily Total Insolation on a Horizontal Surface	(8)	(Btu/ft^2-day)	1,204	I
CALCULATED VARIABLES				
Standing Loss Calculations				
Average Daily Ambient Temperature Range	(c)	(°R)	20.1	ΔT_A
Tank Roof Surface Solar Absorptance	(10)	--	0.25	α_R
Tank Shell Surface Solar Absorptance	(10)	--	0.25	α_S
Average Tank Surface Solar Absorptance	(d)	--	0.25	α
Average Daily Vapor Temperature Range	(e)	(°R)	20.1	ΔT_V
Vapor Space Expansion Factor	(f)	--	0.036	K_E
Liquid Height	(13)	(ft)	3.55	H_L
Tank Shell Radius	(1)	(ft)	3.50	R_S
Tank Roof Height	(14)	(ft)	0.94	H_R
Roof Outage	(15)	(ft)	0.48	H_{RO}
Vapor Space Outage	(g)	(ft)	4.03	H_{VO}
Vented Vapor Saturation Factor	(h)	--	0.80	K_S
Average Daily Ambient Temperature	(i)	(°R)	512	T_{AA}
Liquid Bulk Temperature	(j)	(°R)	513	T_B
Average Vapor Temperature	(k)	(°R)	515	T_V
Stock Vapor Density	(l)	(lb/ft^3)	9.5E-03	W_V
Annual Standing Loss	(m)	(lb/yr)	15.7	L_S
Daily Standing Loss	(n)	(lb/day)	0.043	--
Working Loss Calculations				
Annual Net Working Loss Throughput	(o)	(ft^3/yr)	534,720	V_Q
Annual Sum of the Increase is Liquid Level	(p)	(ft/yr)	13,894	ΣH_{QI}
Number of Turnovers per Year	(q)	--	2,724	N
Working Loss Turnover (Saturation) Factor per Year	(r)	--	0.18	K_N
Daily Net Working Loss Throughput	(o)	(ft^3/day)	1,465	V_Q
Daily Sum of the Increase is Liquid Level	(p)	(ft/day)	38.1	ΣH_{QI}
Number of Turnovers per Day	(q)	--	7.46	N
Working Loss Turnover (Saturation) Factor per Day	(r)	--	1.00	K_N
Working Loss Product Factor	(26)	--	1.00	K_P
Vent Setting Correction Factor	(27)	--	1.00	K_B
Annual Working Loss	(s)	(lb/yr)	905	L_W
Daily Working Loss	(t)	(lb/day)	14.0	--
Annual Total Tank Routine Losses	(u)	**(tons/yr)**	**0.46**	L_T
Daily Total Tank Routine Losses	(v)	**(lb/day)**	**14.0**	**--**
Average Hourly Tank Routine Losses	(w)	**(lb/hr)**	**0.58**	**--**

All notes and references are provided on the following page. See Table 5 (Continued), Production Line 2 Hold Tank T7 VOC Emission Estimates.

Table 5 (Continued)
Production Line 2 Hold Tank T7 VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Notes

bbl = barrel.
Btu = British thermal unit.
°C = degrees Celsius.
°F = degrees Fahrenheit.
ft = foot.
ft^2 = square foot.
ft^3 = cubic foot.
gal = gallon.
lb = pound.
lb-mol = pound mole.
mm Hg = millimeters mercury.
psi = pounds per square inch.
psia = pounds per square inch absolute.
°R = degrees Rankine.
yr = year.

[a] Total annual or daily throughput (bbl/"unit") = (total annual or daily throughput [gal/"unit"]) x (bbl/42 gal)

[b] Vapor pressure (psia) = (0.019337 psi/mm Hg) x (10)^([constant A] - [{constant B (°C)} / {([liquid temperature {°F}] - 32) x (5/9) + (constant C [°C])}]); See Reference (6).

Constant A =	8.247	(7)
Constant B (°C) =	1670.4	(7)
Constant C (°C) =	232.96	(7)

[c] Average daily ambient temperature range (°R) = ([daily maximum ambient temperature {°R}] - [daily minimum ambient temperature {°R}]); See Reference (9).

[d] Average tank surface solar absorbance = ([tank roof surface solar absorptance] + [tank shell surface solar absorptance]) / 2; See Reference (10).

[e] Average daily vapor temperature range (°R) = ([0.7] x [average daily temperature range {°R}]) + ([0.02] x [average tank surface solar absorptance]
x [average daily total insolation factor {Btu/ft²-day}]); See Reference (11).

[f] Vapor space expansion factor = (0.0018) x (average daily vapor temperature range [°R]); See Reference (12).

[g] Vapor space outage (ft) = (tank shell height [ft]) - (liquid height [ft]) + (roof outage [ft]); See Reference (16).

[h] Vented vapor saturation factor = (1) / ([1] + [0.053] x [vapor pressure at average daily liquid surface temperature {psia}] x [vapor space outage {ft}]); See Reference (17).

[i] Average daily ambient temperature (°R) = ([average daily maximum ambient temperature {°R}] + [average daily minimum ambient temperature {°R}]) / (2); See Reference (18).

[j] If non-heated tank: Liquid bulk temperature (°R) = (average daily ambient temperature [°R]) + ([0.003] x [tank shell surface solar absorptance {°R}]
x [average daily total insolation factor {Btu/ft²-day}]); See Reference (19).
For heated tanks, the setpoint temperature for the storage tank is assumed to be representative of the liquid bulk temperature.

[k] Average vapor temperature (°R) = ([2.2 x {tank shell height |ft|} / {tank diameter |ft|} + 1.1] x [average daily ambient temperature {°R}] + [0.8 x {liquid bulk temperature |°R|}] + [0.021
x {tank roof surface solar absorptance} x {average daily total insolation factor |Btu/ft²-day|}] + [0.013 x {tank shell height |ft|} / {tank diameter |ft|} x {tank shell surface solar absorptance}
x {average daily total insolation factor {|Btu/ft²-day|}]) / (2.2 x [tank shell height {ft}] / [tank diameter {ft}] + 1.9); See Reference (20)

[l] Vapor density (lb/ft³) = ([vapor molecular weight {lb/lb-mole}] x [true vapor pressure {psia}]) / ([10.731 psia-ft³/lb-mole-°R] x [average vapor temperature {°R}]); See Reference (21).

[m] Annual standing loss (lb/yr) = (365) x (vapor space exp. factor per day) x ([π/4] x [diameter {ft}]²) x (vapor space outate [ft]) x (vented vapor saturation factor) x (stock vapor density [lb/ft³])
x (1 - [control efficiency {%} / 100]); See Reference (22).

[n] Daily standing loss (lb/day) = (annual standing loss [lb/yr]) / (365 days/yr)

[o] Net working loss throughput (ft³/yr) = (5.614 ft³//bbl) x (total annual throughput [bbl/yr]); See Reference (23).

[p] Annual sum of the increases in liquid level (ft/yr) = ([5.614] x [total annual throughput {bbl/yr}]) / ([π/4] x [tank diameter {ft}]²); See Reference (24).

[q] Number of turnovers per year = (annual sum of the increases in liquid level [ft/yr]) / ([maximum liquid height {ft}] - [minimum liquid height {ft}]); See Reference (25).

[r] If N <= 36, working loss turnover factor equal to 1, or working loss turnover factor = ([180] + [number of turnovers per year]) / ([6] x [number of turnovers per year]); See Reference (27).

[s] Annual working loss (lb/yr) = (net working loss throughput [ft³/yr]) x (working loss turnover factor) x (working loss product factor) x (vapor density [lb/ft³]) x (vent setting correction factor)
x (1- [control efficiency {%} / 100]); See Reference (28).

[t] Daily working loss (lb/day) = (net working loss throughput [ft³/day]) x (working loss turnover factor) x (working loss product factor) x (vapor density [lb/ft³]) x (vent setting correction factor)
x (1 - [control efficiency {%} / 100]); See Reference (28).

[u] Annual total tank routine losses (tons/yr) = ([annual standing losses {lb/yr}] + [annual working losses {lb/yr }]) x (ton/2,000 lb); See Reference (29).

[v] Daily total tank routine losses (lb/day) = (daily standing losses [lb/day]) + (daily working losses [lb/day]); See Reference (29).

[w] Average hourly tank routine losses (lb/hr) = (daily total tank routine losses [lb/day]) x (day/24 hr)

References

(1) See Table 2, Storage Tanks—Input Assumptions and Parameters.
(2) See Table 1, Input Process Rates and Parameters.
(3) Conservative assumption based on typical tank designs.
(4) AP-42, Chapter 7 (June 2020); see equation 1-36. For vertical tanks, value set to 1. For horizontal tanks, value set to 0.
(5) Conservatively assumes 100 percent VOC content for mixture in tank. Assumed physical properties of predominant VOC constituent as representative of VOC content of mixture.
(6) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." See table reference (b).
(7) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." Assumed physical properties of predominant VOC constituent as representative of VOC content of mixtur
(8) AP-42, Chapter 7 (June 2020); Table 7.1-7. Assumes information for Eugene, Oregon.
(9) AP-42, Chapter 7 (June 2020); see equation 1-11.
(10) AP-42, Chapter 7 (June 2020); Table 7.1-6.
(11) AP-42, Chapter 7 (June 2020); see equation 1-7.
(12) AP-42, Chapter 7 (June 2020); see equation 1-12.
(13) AP-42, Chapter 7 (June 2020); see equation 1-16. Per equation 1-16, liquid height typically assumed to be at the half-full level in the absence of site-specific data.
(14) AP-42, Chapter 7 (June 2020); see equation 1-18 for cone roofs (assumes standard cone roof slope of 0.0625 ft/ft), or see equation 1-20 for dome roofs (assumes modified dome roof radius equation).
(15) AP-42, Chapter 7 (June 2020); see equation 1-17 for cone roofs, or see equation 1-19 for dome roofs.
(16) AP-42, Chapter 7 (June 2020); see equation 1-16.
(17) AP-42, Chapter 7 (June 2020); see equation 1-21. Assumes true vapor pressure as the vapor pressure at average daily liquid surface temperature.
(18) AP-42, Chapter 7 (June 2020); see equation 1-30.
(19) AP-42, Chapter 7 (June 2020); see equation 1-31.
(20) AP-42, Chapter 7 (June 2020); see equation 1-32. Note the simplified version of this equation (e.g. equation 1-33) was not used since HS/D is not equal to 0.5, and allows for variances in α_R and α_S.
(21) AP-42, Chapter 7 (June 2020); see equation 1-22.
(22) AP-42, Chapter 7 (June 2020); see equation 1-4.
(23) AP-42, Chapter 7 (June 2020); see equation 1-39.
(24) AP-42, Chapter 7 (June 2020); see equation 1-37.
(25) AP-42, Chapter 7 (June 2020); see equation 1-36.
(26) AP-42, Chapter 7 (June 2020); see notes for equation 1-35. Assumes KP = 0.75 for crude oils, or 1 for all other organic liquids.
(27) AP-42, Chapter 7 (June 2020); see notes for equation 1-35.
(28) AP-42, Chapter 7 (June 2020); see equation 1-35.
(29) AP-42, Chapter 7 (June 2020); see equation 1-1.

Table 6
Production Line 2 Storage Tank T8 VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Parameter		(Units)	Production Line 2	AP-42 Variable
PRODUCTION VALUES				
Storage Tank ID	(1)	--	T8 (Storage Tank)	--
Total Number of Storage Tanks	(1)	--		--
Total Annual Throughput	(1)	(gal/yr)	2,260,820	--
Total Annual Throughput	(a)	(bbl/yr)	53,829	Q
Maximum Daily Throughput	(1)	(gal/day)	11,750	--
Maximum Daily Throughput	(a)	(bbl/day)	280	--
Annual Days of Operation	(2)	(days/yr)	365	--
TANK PROPERTIES				
Tank Type (Fixed Roof or Internal Floating Roof Tank)	(1)	--	Fixed Roof	--
Heated or Non-heated?	(1)	--	Non-Heated	--
Controlled or Fugitive?	(1)	--	Fugitive	--
Control Efficiency	(1)	(%)	0	--
Tank Roof Color	(1)	--	White	--
Tank Roof Condition	(1)	--	Average	--
Tank Shell Color	(1)	--	White	--
Tank Shell Condition	(1)	--	Average	--
Horizontal or Vertical	(1)	--	Vertical	--
Tank Diameter	(1)	(ft)	10.0	D
Tank Shell Height	(1)	(ft)	21.0	H_S
Roof Type	(3)	--	Dome	--
Maximum Liquid Height	(1)	(ft)	20.0	H_{LX}
Minimum Liquid Height	(4)	(ft)	1.00	H_{LN}
TANK CONTENT PROPERTIES				
Liquid Temperature	(1)	(°F)	77.0	T
Liquid Molecular Weight	(5)	(lb/lb-mole)	46.1	M_L
Vapor Molecular Weight	(5)	(lb/lb-mole)	46.1	M_V
True Vapor Pressure	(b)	(psia)	1.14	P_{VA}
ENVIRONMENTAL FACTORS				
Average Daily Maximum Ambient Temperature	(8)	(°R)	522	T_{AX}
Average Daily Minimum Ambient Temperature	(8)	(°R)	502	T_{AN}
Average Daily Total Insolation on a Horizontal Surface	(8)	(Btu/ft^2-day)	1,204	I
CALCULATED VARIABLES				
Standing Loss Calculations				
Average Daily Ambient Temperature Range	(c)	(°R)	20.1	ΔT_A
Tank Roof Surface Solar Absorptance	(10)	--	0.25	α_R
Tank Shell Surface Solar Absorptance	(10)	--	0.25	α_S
Average Tank Surface Solar Absorptance	(d)	--	0.25	α
Average Daily Vapor Temperature Range	(e)	(°R)	20.1	ΔT_V
Vapor Space Expansion Factor	(f)	--	0.036	K_E
Liquid Height	(13)	(ft)	10.5	H_L
Tank Shell Radius	(1)	(ft)	5.00	R_S
Tank Roof Height	(14)	(ft)	1.34	H_R
Roof Outage	(15)	(ft)	0.69	H_{RO}
Vapor Space Outage	(g)	(ft)	11.2	H_{VO}
Vented Vapor Saturation Factor	(h)	--	0.60	K_S
Average Daily Ambient Temperature	(i)	(°R)	512	T_{AA}
Liquid Bulk Temperature	(j)	(°R)	513	T_B
Average Vapor Temperature	(k)	(°R)	515	T_V
Stock Vapor Density	(l)	(lb/ft^3)	9.5E-03	W_V
Annual Standing Loss	(m)	(lb/yr)	65.9	L_S
Daily Standing Loss	(n)	(lb/day)	0.18	--
Working Loss Calculations				
Annual Net Working Loss Throughput	(o)	(ft^3/yr)	302,196	V_Q
Annual Sum of the Increase is Liquid Level	(p)	(ft/yr)	3,848	ΣH_{QI}
Number of Turnovers per Year	(q)	--	203	N
Working Loss Turnover (Saturation) Factor per Year	(r)	--	0.31	K_N
Daily Net Working Loss Throughput	(o)	(ft^3/day)	1,571	V_Q
Daily Sum of the Increase is Liquid Level	(p)	(ft/day)	20.0	ΣH_{QI}
Number of Turnovers per Day	(q)	--	1.05	N
Working Loss Turnover (Saturation) Factor per Day	(r)	--	1.00	K_N
Working Loss Product Factor	(26)	--	1.00	K_P
Vent Setting Correction Factor	(27)	--	1.00	K_B
Annual Working Loss	(s)	(lb/yr)	907	L_W
Daily Working Loss	(t)	(lb/day)	15.0	--
Annual Total Tank Routine Losses	**(u)**	**(tons/yr)**	**0.49**	L_T
Daily Total Tank Routine Losses	**(v)**	**(lb/day)**	**15.1**	**--**
Average Hourly Tank Routine Losses	**(w)**	**(lb/hr)**	**0.63**	**--**

All notes and references are provided on the following page. See Table 6 (Continued), Production Line 2 Storage Tank T8 VOC Emission Estimates.

Table 6 (Continued)
Production Line 2 Storage Tank T8 VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Notes

bbl = barrel.
Btu = British thermal unit.
°C = degrees Celsius.
°F = degrees Fahrenheit.
ft = foot.
ft^2 = square foot.
ft^3 = cubic foot.
gal = gallon.
lb = pound.
lb-mol = pound mole.
mm Hg = millimeters mercury.
psi = pounds per square inch.
psia = pounds per square inch absolute.
°R = degrees Rankine.
yr = year.

(a) Total annual or daily throughput (bbl/"unit") = (total annual or daily throughput [gal/"unit"]) x (bbl/42 gal)

(b) Vapor pressure (psia) = (0.019337 psi/mm Hg) x (10)^([constant A] - [{constant B (°C)} / {([liquid temperature {°F}] - 32) x (5/9) + (constant C [°C])}]); See Reference (6).

Constant A =	8.247	(7)
Constant B (°C) =	1670.4	(7)
Constant C (°C) =	232.96	(7)

(c) Average daily ambient temperature range (°R) = ([daily maximum ambient temperature {°R}] - [daily minimum ambient temperature {°R}]); See Reference (9).

(d) Average tank surface solar absorbance = ([tank roof surface solar absorptance] + [tank shell surface solar absorptance]) / 2; See Reference (10).

(e) Average daily vapor temperature range (°R) = ([0.7] x [average daily temperature range {°R}]) + ([0.02] x [average tank surface solar absorptance] x [average daily total insolation factor {Btu/ft²-day}]); See Reference (11).

(f) Vapor space expansion factor = (0.0018) x (average daily vapor temperature range [°R]); See Reference (12).

(g) Vapor space outage (ft) = (tank shell height [ft]) - (liquid height [ft]) + (roof outage [ft]); See Reference (16).

(h) Vented vapor saturation factor = (1) / ([1] + [0.053] x [vapor pressure at average daily liquid surface temperature {psia}] x [vapor space outage {ft}]); See Reference (17).

(i) Average daily ambient temperature (°R) = ([average daily maximum ambient temperature {°R}] + [average daily minimum ambient temperature {°R}]) / (2); See Reference (18).

(j) If non-heated tank: Liquid bulk temperature (°R) = (average daily ambient temperature [°R]) + ([0.003] x [tank shell surface solar absorptance {°R}] x [average daily total insolation factor {Btu/ft²-day}]); See Reference (19).
For heated tanks, the setpoint temperature for the storage tank is assumed to be representative of the liquid bulk temperature.

(k) Average vapor temperature (°R) = ([2.2 x {tank shell height |ft|} / {tank diameter |ft|} + 1.1] x [average daily ambient temperature {°R}] + [0.8 x {liquid bulk temperature |°R|}] + [0.021 x {tank roof surface solar absorptance} x {average daily total insolation factor |Btu/ft²-day|}] + [0.013 x {tank shell height |ft|} / {tank diameter |ft|} x {tank shell surface solar absorptance} x {average daily total insolation factor {|Btu/ft²-day|}]) / (2.2 x [tank shell height {ft}] / [tank diameter {ft}] + 1.9); See Reference (20)

(l) Vapor density (lb/ft³) = ([vapor molecular weight {lb/lb-mole}] x [true vapor pressure {psia}]) / ([10.731 psia-ft³/lb-mole-°R] x [average vapor temperature {°R}]); See Reference (21).

(m) Annual standing loss (lb/yr) = (365) x (vapor space exp. factor per day) x ([π/4] x [diameter {ft}]²) x (vapor space outate [ft]) x (vented vapor saturation factor) x (stock vapor density [lb/ft³]) x (1 - [control efficiency {%} / 100]); See Reference (22).

(n) Daily standing loss (lb/day) = (annual standing loss [lb/yr]) / (365 days/yr)

(o) Net working loss throughput (ft³/yr) = (5.614 ft³//bbl) x (total annual throughput [bbl/yr]); See Reference (23).

(p) Annual sum of the increases in liquid level (ft/yr) = ([5.614] x [total annual throughput {bbl/yr}]) / ([π/4] x [tank diameter {ft}]²); See Reference (24).

(q) Number of turnovers per year = (annual sum of the increases in liquid level [ft/yr]) / ([maximum liquid height {ft}] - [minimum liquid height {ft}]); See Reference (25).

(r) If N <= 36, working loss turnover factor equal to 1, or working loss turnover factor = ([180] + [number of turnovers per year]) / ([6] x [number of turnovers per year]); See Reference (27).

(s) Annual working loss (lb/yr) = (net working loss throughput [ft³/yr]) x (working loss turnover factor) x (working loss product factor) x (vapor density [lb/ft³]) x (vent setting correction factor) x (1- [control efficiency {%} / 100]); See Reference (28).

(t) Daily working loss (lb/day) = (net working loss throughput [ft³/day]) x (working loss turnover factor) x (working loss product factor) x (vapor density [lb/ft³]) x (vent setting correction factor) x (1 - [control efficiency {%} / 100]); See Reference (28).

(u) Annual total tank routine losses (tons/yr) = ([annual standing losses {lb/yr}] + [annual working losses {lb/yr }]) x (ton/2,000 lb); See Reference (29).

(v) Daily total tank routine losses (lb/day) = (daily standing losses [lb/day]) + (daily working losses [lb/day]); See Reference (29).

(w) Average hourly tank routine losses (lb/hr) = (daily total tank routine losses [lb/day]) x (day/24 hr)

References

(1) See Table 2, Storage Tanks—Input Assumptions and Parameters.
(2) See Table 1, Input Process Rates and Parameters.
(3) Conservative assumption based on typical tank designs.
(4) AP-42, Chapter 7 (June 2020); see equation 1-36. For vertical tanks, value set to 1. For horizontal tanks, value set to 0.
(5) Conservatively assume 100 percent VOC content for mixture in tank. Assumed physical properties of predominant VOC constituent as representative of VOC content of mixture.
(6) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." See table reference (b).
(7) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." Assumed physical properties of predominant VOC constituent as representative of VOC content of mixtur
(8) AP-42, Chapter 7 (June 2020); Table 7.1-7. Assumes information for Eugene, Oregon.
(9) AP-42, Chapter 7 (June 2020); see equation 1-11.
(10) AP-42, Chapter 7 (June 2020); Table 7.1-6.
(11) AP-42, Chapter 7 (June 2020); see equation 1-7.
(12) AP-42, Chapter 7 (June 2020); see equation 1-12.
(13) AP-42, Chapter 7 (June 2020); see equation 1-16. Per equation 1-16, liquid height typically assumed to be at the half-full level in the absence of site-specific data.
(14) AP-42, Chapter 7 (June 2020); see equation 1-18 for cone roofs (assumes standard cone roof slope of 0.0625 ft/ft), or see equation 1-20 for dome roofs (assumes modified dome roof radius equation).
(15) AP-42, Chapter 7 (June 2020); see equation 1-17 for cone roofs, or see equation 1-19 for dome roofs.
(16) AP-42, Chapter 7 (June 2020); see equation 1-16.
(17) AP-42, Chapter 7 (June 2020); see equation 1-21. Assumes true vapor pressure as the vapor pressure at average daily liquid surface temperature.
(18) AP-42, Chapter 7 (June 2020); see equation 1-30.
(19) AP-42, Chapter 7 (June 2020); see equation 1-31.
(20) AP-42, Chapter 7 (June 2020); see equation 1-32. Note the simplified version of this equation (e.g. equation 1-33) was not used since HS/D is not equal to 0.5, and allows for variances in α_R and α_S.
(21) AP-42, Chapter 7 (June 2020); see equation 1-22.
(22) AP-42, Chapter 7 (June 2020); see equation 1-4.
(23) AP-42, Chapter 7 (June 2020); see equation 1-39.
(24) AP-42, Chapter 7 (June 2020); see equation 1-37.
(25) AP-42, Chapter 7 (June 2020); see equation 1-36.
(26) AP-42, Chapter 7 (June 2020); see notes for equation 1-35. Assumes KP = 0.75 for crude oils, or 1 for all other organic liquids.
(27) AP-42, Chapter 7 (June 2020); see notes for equation 1-35.
(28) AP-42, Chapter 7 (June 2020); see equation 1-35.
(29) AP-42, Chapter 7 (June 2020); see equation 1-1.

Table 7
Production Line 2 Storage Tank T4B VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Parameter		(Units)	Production Line 2	AP-42 Variable
PRODUCTION VALUES				
Storage Tank ID	(1)	--	T4B (Storage Tank)	--
Total Number of Storage Tanks	(1)	--	1	--
Total Annual Throughput	(1)	(gal/yr)	1,739,580	--
Total Annual Throughput	(a)	(bbl/yr)	41,419	Q
Maximum Daily Throughput	(1)	(gal/day)	9,041	--
Maximum Daily Throughput	(a)	(bbl/day)	215	--
Annual Days of Operation	(2)	(days/yr)	365	--
TANK PROPERTIES				
Tank Type (Fixed Roof or Internal Floating Roof Tank)	(1)	--	Fixed Roof	--
Heated or Non-heated?	(1)	--	Non-Heated	--
Controlled or Fugitive?	(1)	--	Fugitive	--
Control Efficiency	(1)	(%)	0	--
Tank Roof Color	(1)	--	White	--
Tank Roof Condition	(1)	--	Average	--
Tank Shell Color	(1)	--	White	--
Tank Shell Condition	(1)	--	Average	--
Horizontal or Vertical	(1)	--	Vertical	--
Tank Diameter	(1)	(ft)	9.00	D
Tabl Tank Shell Height	(1)	(ft)	20.0	H_S
Roof Type	(3)	--	Dome	--
Maximum Liquid Height	(1)	(ft)	19.0	H_{LX}
Minimum Liquid Height	(4)	(ft)	1.00	H_{LN}
TANK CONTENT PROPERTIES				
Liquid Temperature	(1)	(°F)	77.0	T
Liquid Molecular Weight	(5)	(lb/lb-mole)	46.1	M_L
Vapor Molecular Weight	(5)	(lb/lb-mole)	46.1	M_V
True Vapor Pressure	(b)	(psia)	1.14	P_{VA}
ENVIRONMENTAL FACTORS				
Average Daily Maximum Ambient Temperature	(8)	(°R)	522	T_{AX}
Average Daily Minimum Ambient Temperature	(8)	(°R)	502	T_{AN}
Average Daily Total Insolation on a Horizontal Surface	(8)	(Btu/ft^2-day)	1,204	I
CALCULATED VARIABLES				
Standing Loss Calculations				
Average Daily Ambient Temperature Range	(c)	(°R)	20.1	ΔT_A
Tank Roof Surface Solar Absorptance	(10)	--	0.25	α_R
Tank Shell Surface Solar Absorptance	(10)	--	0.25	α_S
Average Tank Surface Solar Absorptance	(d)	--	0.25	α
Average Daily Vapor Temperature Range	(e)	(°R)	20.1	ΔT_V
Vapor Space Expansion Factor	(f)	--	0.036	K_E
Liquid Height	(13)	(ft)	10.0	H_L
Tank Shell Radius	(1)	(ft)	4.50	R_S
Tank Roof Height	(14)	(ft)	1.21	H_R
Roof Outage	(15)	(ft)	0.62	H_{RO}
Vapor Space Outage	(g)	(ft)	10.6	H_{VO}
Vented Vapor Saturation Factor	(h)	--	0.61	K_S
Average Daily Ambient Temperature	(i)	(°R)	512	T_{AA}
Liquid Bulk Temperature	(j)	(°R)	513	T_B
Average Vapor Temperature	(k)	(°R)	515	T_V
Stock Vapor Density	(l)	(lb/ft^3)	9.5E-03	W_V
Annual Standing Loss	(m)	(lb/yr)	51.7	L_S
Daily Standing Loss	(n)	(lb/day)	0.14	--
Working Loss Calculations				
Annual Net Working Loss Throughput	(o)	(ft^3/yr)	232,524	V_Q
Annual Sum of the Increase is Liquid Level	(p)	(ft/yr)	3,455	ΣH_{QI}
Number of Turnovers per Year	(q)	--	203	N
Working Loss Turnover (Saturation) Factor per Year	(r)	--	0.31	K_N
Daily Net Working Loss Throughput	(o)	(ft^3/day)	1,208	V_Q
Daily Sum of the Increase is Liquid Level	(p)	(ft/day)	19.0	ΣH_{QI}
Number of Turnovers per Day	(q)	--	1.06	N
Working Loss Turnover (Saturation) Factor per Day	(r)	--	1.00	K_N
Working Loss Product Factor	(26)	--	1.00	K_P
Vent Setting Correction Factor	(27)	--	1.00	K_B
Annual Working Loss	(s)	(lb/yr)	697	L_W
Daily Working Loss	(t)	(lb/day)	11.5	--
Annual Total Tank Routine Losses	**(u)**	**(tons/yr)**	**0.37**	**L_T**
Daily Total Tank Routine Losses	**(v)**	**(lb/day)**	**11.7**	**--**
Average Hourly Tank Routine Losses	**(w)**	**(lb/hr)**	**0.49**	**--**

All notes and references are provided on the following page. See Table 7 (Continued), Production Line 2 Storage Tank T4B VOC Emission Estimates.

Table 7 (Continued)
Production Line 2 Storage Tank T4B VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Notes

bbl = barrel.
Btu = British thermal unit.
°C = degrees Celsius.
°F = degrees Fahrenheit.
ft = foot.
ft^2 = square foot.
ft^3 = cubic foot.
gal = gallon.
lb = pound.
lb-mol = pound mole.
mm Hg = millimeters mercury.
psi = pounds per square inch.
psia = pounds per square inch absolute.
°R = degrees Rankine.
yr = year.

[a] Total annual or daily throughput (bbl/"unit") = (total annual or daily throughput [gal/"unit"]) x (bbl/42 gal)

[b] Vapor pressure (psia) = (0.019337 psi/mm Hg) x (10)^([constant A] - [{constant B (°C)} / {([liquid temperature {°F}] - 32) x (5/9) + (constant C [°C])}]); See Reference (6).

Constant A =	8.247	(7)
Constant B (°C) =	1670.4	(7)
Constant C (°C) =	232.96	(7)

[c] Average daily ambient temperature range (°R) = ([daily maximum ambient temperature {°R}] - [daily minimum ambient temperature {°R}]); See Reference (9).

[d] Average tank surface solar absorbance = ([tank roof surface solar absorptance] + [tank shell surface solar absorptance]) / 2; See Reference (10).

[e] Average daily vapor temperature range (°R) = ([0.7] x [average daily temperature range {°R}]) + ([0.02] x [average tank surface solar absorptance] x [average daily total insolation factor {Btu/ft^2-day}]); See Reference (11).

[f] Vapor space expansion factor = (0.0018) x (average daily vapor temperature range [°R]); See Reference (12).

[g] Vapor space outage (ft) = (tank shell height [ft]) - (liquid height [ft]) + (roof outage [ft]); See Reference (16).

[h] Vented vapor saturation factor = (1) / ([1] + [0.053] x [vapor pressure at average daily liquid surface temperature {psia}] x [vapor space outage {ft}]); See Reference (17).

[i] Average daily ambient temperature (°R) = ([average daily maximum ambient temperature {°R}] + [average daily minimum ambient temperature {°R}]) / (2); See Reference (18).

[j] If non-heated tank: Liquid bulk temperature (°R) = (average daily ambient temperature [°R]) + ([0.003] x [tank shell surface solar absorptance {°R}] x [average daily total insolation factor {Btu/ft^2-day}]); See Reference (19).
For heated tanks, the setpoint temperature for the storage tank is assumed to be representative of the liquid bulk temperature.

[k] Average vapor temperature (°R) = ([2.2 x {tank shell height |ft|} / {tank diameter |ft|} + 1.1] x [average daily ambient temperature {°R}] + [0.8 x {liquid bulk temperature |°R|}] + [0.021 x {tank roof surface solar absorptance} x {average daily total insolation factor |Btu/ft^2-day|}] + [0.013 x {tank shell height |ft|} / {tank diameter |ft|} x {tank shell surface solar absorptance} x {average daily total insolation factor {|Btu/ft^2-day|}]) / (2.2 x [tank shell height {ft}] / [tank diameter {ft}] + 1.9); See Reference (20)

[l] Vapor density (lb/ft^3) = ([vapor molecular weight {lb/lb-mole}] x [true vapor pressure {psia}]) / ([10.731 psia-ft^3/lb-mole-°R] x [average vapor temperature {°R}]); See Reference (21).

[m] Annual standing loss (lb/yr) = (365) x (vapor space exp. factor per day) x ([π/4] x [diameter {ft}]^2) x (vapor space outate [ft]) x (vented vapor saturation factor) x (stock vapor density [lb/ft^3]) x (1 - [control efficiency {%} / 100]); See Reference (22).

[n] Daily standing loss (lb/day) = (annual standing loss [lb/yr]) / (365 days/yr)

[o] Net working loss throughput (ft^3/yr) = (5.614 ft^3//bbl) x (total annual throughput [bbl/yr]); See Reference (23).

[p] Annual sum of the increases in liquid level (ft/yr) = ([5.614] x [total annual throughput {bbl/yr}]) / ([π/4] x [tank diameter {ft}]^2); See Reference (24).

[q] Number of turnovers per year = (annual sum of the increases in liquid level [ft/yr]) / ([maximum liquid height {ft}] - [minimum liquid height {ft}]); See Reference (25).

[r] If N <= 36, working loss turnover factor equal to 1, or working loss turnover factor = ([180] + [number of turnovers per year]) / ([6] x [number of turnovers per year]); See Reference (27).

[s] Annual working loss (lb/yr) = (net working loss throughput [ft^3/yr]) x (working loss turnover factor) x (working loss product factor) x (vapor density [lb/ft^3]) x (vent setting correction factor) x (1- [control efficiency {%} / 100]); See Reference (28).

[t] Daily working loss (lb/day) = (net working loss throughput [ft^3/day]) x (working loss turnover factor) x (working loss product factor) x (vapor density [lb/ft^3]) x (vent setting correction factor) x (1 - [control efficiency {%} / 100]); See Reference (28).

[u] Annual total tank routine losses (tons/yr) = ([annual standing losses {lb/yr}] + [annual working losses {lb/yr}]) x (ton/2,000 lb); See Reference (29).

[v] Daily total tank routine losses (lb/day) = (daily standing losses [lb/day]) + (daily working losses [lb/day]); See Reference (29).

[w] Average hourly tank routine losses (lb/hr) = (daily total tank routine losses [lb/day]) x (day/24 hr)

References

(1) See Table 2, Storage Tanks—Input Assumptions and Parameters.
(2) See Table 1, Input Process Rates and Parameters.
(3) Conservative assumption based on typical tank designs.
(4) AP-42, Chapter 7 (June 2020); see equation 1-36. For vertical tanks, value set to 1. For horizontal tanks, value set to 0.
(5) Conservatively assume 100 percent VOC content for mixture in tank. Assumed physical properties of predominant VOC constituent as representative of VOC content of mixture.
(6) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." See table reference (b).
(7) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." Assumed physical properties of predominant VOC constituent as representative of VOC content of mixtur
(8) AP-42, Chapter 7 (June 2020); Table 7.1-7. Assumes information for Eugene, Oregon.
(9) AP-42, Chapter 7 (June 2020); see equation 1-11.
(10) AP-42, Chapter 7 (June 2020); Table 7.1-6.
(11) AP-42, Chapter 7 (June 2020); see equation 1-7.
(12) AP-42, Chapter 7 (June 2020); see equation 1-12.
(13) AP-42, Chapter 7 (June 2020); see equation 1-16. Per equation 1-16, liquid height typically assumed to be at the half-full level in the absence of site-specific data.
(14) AP-42, Chapter 7 (June 2020); see equation 1-18 for cone roofs (assumes standard cone roof slope of 0.0625 ft/ft), or see equation 1-20 for dome roofs (assumes modified dome roof radius equation).
(15) AP-42, Chapter 7 (June 2020); see equation 1-17 for cone roofs, or see equation 1-19 for dome roofs.
(16) AP-42, Chapter 7 (June 2020); see equation 1-16.
(17) AP-42, Chapter 7 (June 2020); see equation 1-21. Assumes true vapor pressure as the vapor pressure at average daily liquid surface temperature.
(18) AP-42, Chapter 7 (June 2020); see equation 1-30.
(19) AP-42, Chapter 7 (June 2020); see equation 1-31.
(20) AP-42, Chapter 7 (June 2020); see equation 1-32. Note the simplified version of this equation (e.g. equation 1-33) was not used since HS/D is not equal to 0.5, and allows for variances in a_R and a_S.
(21) AP-42, Chapter 7 (June 2020); see equation 1-22.
(22) AP-42, Chapter 7 (June 2020); see equation 1-4.
(23) AP-42, Chapter 7 (June 2020); see equation 1-39.
(24) AP-42, Chapter 7 (June 2020); see equation 1-37.
(25) AP-42, Chapter 7 (June 2020); see equation 1-36.
(26) AP-42, Chapter 7 (June 2020); see notes for equation 1-35. Assumes KP = 0.75 for crude oils, or 1 for all other organic liquids.
(27) AP-42, Chapter 7 (June 2020); see notes for equation 1-35.
(28) AP-42, Chapter 7 (June 2020); see equation 1-35.
(29) AP-42, Chapter 7 (June 2020); see equation 1-1.

Table 8
Production Line 2 Mix Tank VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Parameter		M1 (Mix Tank)
Diameter of Tank (ft)	(1)	7.50
Surface Area of Tank (ft^2)	(a)	44.2
Temperature (°F)	(1)	77.0
Duration of Operation (hrs/batch)	(1)	3.00
Annual Batches (batches/yr)	(1)	2,920
Annual Hours of Operation (hrs/yr)	(b)	8,760

Pollutant	Weight Percent in Solution [2] (%)	Gas Phase Mass Transfer Coefficient [c] (ft/s)	Vapor Pressure [d] (psi)	Liquid Mole Fraction [e]	Partial Pressure [f] (psi)	M1 (Mix Tank) Evaporation Rate [g] (lb/s)	M1 (Mix Tank) Emissions Estimates Hourly [h] (lb/hr)	M1 (Mix Tank) Emissions Estimates Annual [i] (ton/yr)
VOC	10.0	3.5E-03	1.14	0.087	0.099	1.2E-04	0.44	1.93

Notes
°C = degrees Celsius.
°F = degrees Fahrenheit.
ft = feet.
ft^2 = square foot.
ft^3 = cubic foot.
hr = hour.
lb = pound.
lb-mol = pound mole.
mi = mile.
mm Hg = millimeters mercury.
psi = pounds per square inch.
°R = degrees Rankine.
s = seconds.
yr = year.

(a) Surface area of tank (ft^2) = π/4 x (diameter of tank [ft])
(b) Annual hours of operation (hrs/yr) = (duration of operation [hrs/batch]) x (annual batches [batches/hr])
(c) Gas-phase mass transfer coefficient (ft/s) = (0.00438) x (air velocity [mi/hr])$^{0.78}$ x (18 / [molecular weight of VOC lb/lb-mol])$^{1/3}$ see Reference (3).

Air velocity (mi/hr) =	1.12	(4)
Molecular weight of VOC (lb/lb-mol) =	46.07	(5)

(d) Vapor pressure (psi) = (0.019337 psi/mm Hg) x (10)^([constant A] - [{constant B (°C)} / {([liquid temperature {°F}] - 32) x (5/9) + (constant C [°C])}]); See Reference (6).

Liquid temperature (°F) =	77	(7)
Constant A =	8.247	(8)
Constant B (°C) =	1670.4	(8)
Constant C (°C) =	232.96	(8)

(e) Liquid mole fraction = (weight percent in solution [%])/100 x (average molecular weight solution [lb/lb-mol]) / (molecular weight of VOC [lb/lb-mol])

Average molecular weight solution (lb/lb-mol) =	40.0	(10)
Molecular weight of VOC (lb/lb-mol) =	46.07	(5)

(f) Partial pressure of VOC (psi) = (vapor pressure of constituent [psi]) x (liquid mole fraction)
(g) Evaporation rate (lb/s) = (molecular weight of VOC [lb/lb-mol]) x (gas-phase mass transfer coefficient [ft/s]) x (surface area of tank [ft^2]) x (partial vapor pressure of VOC [psi]) / ([gas constant {psi · ft³/°R · lb-mol}] x [tank temperature {°F} + 459.67]); see Reference (3).

Molecular weight of VOC (lb/lb-mol) =	46.07	(5)
Gas constant (psi · ft^3/°R · lb-mol) =	10.7	

(h) Hourly emissions estimate (lb/hr) = (evaporation rate [lb/s]) x (3,600 s/hr)
(i) Annual emissions estimate (tons/yr) = (evaporation rate [lb/s]) x (3,600 s/hr) x (annual hours of operation [hr/yr]) x (ton/2,000 lb)

References
(1) See Table 3, Production Mix Tanks—Input Assumptions and Parameters.
(2) Estimate developed based on review of batch records. VOC content of product is below 10 percent. Conservatively assume 10 percent for this purpose.
(3) EPA, Emission Inventory Improvement Program. "Methods for Estimating Air Emissions from Chemical Manufacturing Facilities" (August 2007). See Section 3.7.
(4) The mixing vessel is located under an enclosure and air flow across the tank surface is assumed to be negligible. However for conservatism, MFA assumes a minimum wind speed threshold across the tank surface of 1.12 mph (0.5 m/s) based on EPA guidance documentation for calm wind speeds.
(5) Assumed physical properties of predominant VOC constituent as representative of VOC content of mixture.
(6) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." See table reference (b).
(7) Assumes standard ambient temperature of 25°C (77°F) since the process tanks are not heated.
(8) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." Assumed physical properties of predominant VOC constituent as representative of VOC content of mixture.
(9) Assume properties of predominant VOC constituent. Vapor pressure derived from publicly-available chemical data using the Clausius-Clapeyron relation at the specified tank temperature.
(10) Estimate developed based on review of batch records.

Table 9
Production Line 1 Mix Tanks VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Parameter		K1 (Mix Tank 1)	K2 (Mix Tank 2)	K3 (Mix Tank 3)
Diameter of Tank (ft)	(1)	3.83	5.00	5.50
Surface Area of Tank (ft^2)	(a)	11.5	19.6	23.8
Temperature (°F)	(1)	77.0	77.0	77.0
Duration of Operation (hrs/batch)	(1)	5.00	5.00	5.00
Annual Batches (batches/yr)	(1)	730	730	730
Annual Hours of Operation (hrs/yr)	(b)	3,650	3,650	3,650

Pollutant	Weight Percent in Solution (2) (%)	Gas Phase Mass Transfer Coefficient (c) (ft/s)	Vapor Pressure (d) (psi)	Liquid Mole Fraction (e)	Partial Pressure (f) (psi)	K1 (Mix Tank 1)			K2 (Mix Tank 2)			K3 (Mix Tank 3)			Total Emissions Estimates	
						Evaporation Rate (g) (lb/s)	Emissions Estimates		Evaporation Rate (g) (lb/s)	Emissions Estimates		Evaporation Rate (g) (lb/s)	Emissions Estimates			
							Hourly (h) (lb/hr)	Annual (i) (ton/yr)		Hourly (h) (lb/hr)	Annual (i) (ton/yr)		Hourly (h) (lb/hr)	Annual (i) (ton/yr)	Hourly (lb/hr)	Annual (ton/yr)
VOC	5.00	3.5E-03	17.4	0.027	0.47	1.5E-04	0.53	0.98	2.5E-04	0.91	1.66	3.1E-04	1.10	2.01	2.55	4.65

Notes

°C = degrees Celsius.
°F = degrees Fahrenheit.
ft = feet.
ft^2 = square foot.
ft^3 = cubic foot.
hr = hour.
lb = pound.
lb-mol = pound mole.
mi = mile.
mm Hg = millimeters mercury.
psi = pounds per square inch.
°R = degrees Rankine.
s = seconds.
yr = year.

(a) Surface area of tank (ft^2) = π/4 x (diameter of tank [ft])

(b) Annual hours of operation (hrs/yr) = (duration of operation [hrs/batch]) x (annual batches [batches/hr])

(c) Gas-phase mass transfer coefficient (ft/s) = (0.00438) x (air velocity [mi/hr])$^{0.78}$ x (18 / [molecular weight of VOC lb/lb-mol}])$^{1/3}$ see Reference (3).

Air velocity (mi/hr) =	1.12	(4)
Molecular weight of VOC (lb/lb-mol) =	44.05	(5)

(d) Vapor pressure (psi) = (0.019337 psi/mm Hg) x (10)^([constant A] - [{constant B (°C)} / {([liquid temperature {°F}] - 32) x (5/9) + (constant C [°C])}]); See Reference (6).

Constant A =	8.063	(7)
Constant B (°C) =	1637.1	(7)
Constant C (°C) =	295.47	(7)

(e) Liquid mole fraction = (weight percent in solution [%])/100 x (average molecular weight solution [lb/lb-mol]) / (molecular weight of VOC [lb/lb-mol])

Average molecular weight solution (lb/lb-mol) =	24.0	(8)
Molecular weight of VOC (lb/lb-mol) =	44.05	(5)

(f) Partial pressure of VOC (psi) = (vapor pressure of constituent [psi]) x (liquid mole fraction)

(g) Evaporation rate (lb/s) = (molecular weight of VOC [lb/lb-mol]) x (gas-phase mass transfer coefficient [ft/s]) x (surface area of tank [ft^2]) x (partial vapor pressure of VOC [psi]) / ([gas constant {psi · ft^3/°R · lb-mol}] x [tank temperature {°F} + 459.67]); see Reference (3).

Molecular weight of VOC (lb/lb-mol) =	44.05	(5)
Gas constant (psi · ft^3/°R · lb-mol) =	10.7	

(h) Hourly emissions estimate (lb/hr) = (evaporation rate [lb/s]) x (3,600 s/hr)

(i) Annual emissions estimate (tons/yr) = (evaporation rate [lb/s]) x (3,600 s/hr) x (annual hours of operation [hr/yr]) x (ton/2,000 lb)

References

(1) See Table 3, Production Mix Tanks—Input Assumptions and Parameters.
(2) Estimate developed based on review of batch records. VOC content of product is below 5 percent. Conservatively assume 5 percent for this purpose.
(3) EPA, Emission Inventory Improvement Program. "Methods for Estimating Air Emissions from Chemical Manufacturing Facilities" (August 2007). See Section 3.7.
(4) The mixing vessel is located inside a building with bay doors and no HVAC system. The bay doors are open allowing for some air flow through the space, though air flow across the tank surface is assumed to be negligible.
However for conservatism, MFA assumes a minimum wind speed threshold across the tank surface of 1.12 mph (0.5 m/s) based on EPA guidance documentation for calm wind speeds.
(5) Conservatively assumes lowest molecular weight of all VOC constituents in solution.
(6) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." See table reference (b).
(7) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." Conservatively assumes highest vapor pressure of VOC constituents in solution.
(8) Estimate developed based on review of batch records.

Table 10
Production Line 2 Packaging VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Parameter		Production Line 2
Ambient Temperature (°F)	(1)	77.0
Maximum Hourly Fill Rate (gal/hr)	(2)	2,500
Annual Fill Volume (gal/yr)	(2)	2,000,200

Pollutant	Weight Percent in Solution [4] (%)	Vapor Pressure [a] (psi)	Liquid Mole Fraction [b]	Partial Pressure [c] (psi)	Emissions Estimates	
					Hourly [d] (lb/hr)	Annual [e] (ton/yr)
VOC	10.0	1.14	0.087	0.099	1.3E-04	0.10

Notes

°C = degrees Celsius.
°F = degrees Fahrenheit.
ft^3 = cubic foot.
gal = gallon.
hr = hour.
lb = pound.
lb-mol = pound mole.
mm Hg = millimeters mercury.
psi = pounds per square inch.
°R = degrees Rankine.
yr = year.

(a) Vapor pressure (psi) = (0.019337 psi/mm Hg) x (10)^([constant A] - [{constant B (°C)} / {([liquid temperature {°F}] - 32) x (5/9) + (constant C [°C])}]); See Reference (5).

Liquid temperature (°F) =	77	(6)
Constant A =	8.247	(7)
Constant B (°C) =	1670.4	(7)
Constant C (°C) =	232.96	(7)

(b) Liquid mole fraction = (weight percent in solution [%])/100 x (average molecular weight solution [lb/lb-mol]) / (molecular weight of VOC [lb/lb-mol])

Average molecular weight solution (lb/lb-mol) =	40.0	(8)
Molecular weight of VOC (lb/lb-mol) =	46.07	(9)

(d) Partial pressure of VOC (psi) = (vapor pressure of constituent [psi]) x (liquid mole fraction)

(e) Hourly emissions estimate (lb/hr) = (partial pressure of constituent [psi]) x (maximum hourly fill rate [gal/hr]) x (ft^3/7.48 gal) / ([gas constant {psi · ft^3/°R · lb-mol}] x [ambient temperature {°F} + 459.67]) x (molecular weight of VOC [lb/lb-mol]); see Reference (10).

Gas constant (psi · ft^3/°R · lb-mol) =	10.7	
Molecular weight of VOC (lb/lb-mol) =	46.07	(9)

(f) Annual emissions estimate (lb/yr) = (partial pressure of constituent [psi]) x (annual fill volume [gal/yr]) x (ft^3/7.48 gal) / ([gas constant {psi · ft^3/°R · lb-mol}] x [ambient temperature {°F} + 459.67]) x (molecular weight of VOC [lb/lb-mol]); see Reference (10).

Gas constant (psi · ft^3/°R · lb-mol) =	10.7	
Molecular weight of VOC (lb/lb-mol) =	46.07	(9)

Table 10 (Continued)
Production Line 2 Packaging VOC Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

References

(1) Assumes standard ambient temperature of 25°C (77°F) as an average annual estimate.

(2) See Table 1, Input Process Rates and Parameters.

(3) Estimate developed based on review of batch records. VOC content of product is below 10 percent. Conservatively assume 10 percent for this purpose.

(4) Assume properties of predominant VOC constituent. Vapor pressure derived from publicly-available chemical data using the Clausius-Clapeyron relation at the specified tank temperature.

(5) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." See table reference (b).

(6) Assumes standard ambient temperature of 25°C (77°F) since the product is not heated for packaging.

(7) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." Assumed physical properties of predominant VOC constituent as representative of VOC content of mixture.

(8) Estimate developed based on review of batch records.

(9) Assumed physical properties of predominant VOC constituent as representative of VOC content of mixture.

(10) EPA, Emission Inventory Improvement Program. "Methods for Estimating Air Emissions from Chemical Manufacturing Facilities" (August 2007). See Section 3.1.

Table 11
Natural Gas Combustion Criteria Pollutant and GHG Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Parameter		Boiler	Area Heaters
Hourly Natural Gas Usage (MMscf/hr)	(1)	2.0E-03	1.3E-03
Annual Natural Gas Usage (MMscf/yr)	(1)	17.9	11.1

Pollutant	Emission Factor (lb/MMscf)		Emission Estimates				Total Emissions Estimates	
			Boiler		Area Heaters			
			Hourly [a] (lb/hr)	Annual [b] (tons/yr)	Hourly [a] (lb/hr)	Annual [b] (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)
PM	2.5	(3)	5.1E-03	0.022	3.2E-03	0.014	3.2E-03	0.036
PM_{10}	2.5	(3)	5.1E-03	0.022	3.2E-03	0.014	3.2E-03	0.036
$PM_{2.5}$	2.5	(3)	5.1E-03	0.022	3.2E-03	0.014	3.2E-03	0.036
NO_X	100	(3)	0.20	0.90	0.13	0.55	0.13	1.45
CO	84	(3)	0.17	0.75	0.11	0.47	0.11	1.22
VOC	5.5	(3)	0.011	0.049	7.0E-03	0.031	7.0E-03	0.080
SO_2	2.6	(3)	5.3E-03	0.023	3.3E-03	0.014	3.3E-03	0.038
Pb	5.0E-04	(4)	1.0E-06	4.5E-06	6.3E-07	2.8E-06	6.3E-07	7.3E-06
CO_2	120,000	(4)	246	1,076	152	666	152	1,742
CH_4	2.26	(c)	4.6E-03	0.020	2.9E-03	0.013	2.9E-03	0.033
N_2O	0.23	(c)	4.6E-04	2.0E-03	2.9E-04	1.3E-03	2.9E-04	3.3E-03
CO_2e	120,124	(d)	246	1,077	152	667	152	1,744

Notes

hr = hour.
kg = kilograms.
lb = pound.
MMBtu = million British thermal units.
MMscf = million standard cubic feet.
yr = year.

(a) Hourly emissions estimate (lb/hr) = (emission factor [lb/MMscf]) x (hourly natural gas usage [MMscf/hr])

(b) Annual emissions estimate (tons/yr) = (emission factor [lb/MMscf]) x (annual natural gas usage [MMscf/yr]) x (ton/2,000 lb)

(c) Emission factor (lb/MMscf) = (emission factor [kg/MMBtu]) x (2.205 lb/kg) x (default natural gas high heat value [MMBtu/MMscf])

Default natural gas high heat value (MMBtu/MMscf) = 1,026 (2)
CH_4 emission factor (kg/MMBtu) = 1.0E-03 (5)
N_2O emission factor (kg/MMBtu) = 1.0E-04 (5)

(d) CO_2e emission factor (lb/MMscf) = (CO_2 emission factor [lb/MMscf]) + ([CH_4 emission factor [lb/MMscf]] x [CH_4 global warming potential]) + ([N_2O emission factor [lb/MMscf]] x [N_2O global warming potential])

CH_4 global warming potential = 25.0 (6)
N_2O global warming potential = 298 (6)

References

(1) See Table 1, Input Process Rates and Parameters.
(2) 40 CFR Part 98 Subpart C, Table C-1, "Default CO_2 Emission Factors and High Heat Values for Various Types of Fuel."
(3) Oregon DEQ AQ-EF05 (August 2011). Emission factor for natural gas combustion provided by the Oregon Department of Environmental Quality for uncontrolled medium boilers less than 100 MMBtu/hr.
(4) AP-42 Chapter 1.4 (July 1998), Table 1.4-2 "Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion."
(5) 40 CFR Part 98 Subpart C, Table C-2, "CH_4 and N_2O Emission Factors for Various Types of Fuel."
(6) 40 CFR Part 98 Subpart A, Table A-1, "Global Warming Potentials."

Table 12
Criteria Pollutant and GHG Emission Estimates Summary
OR-CAL, Inc.—Junction City, Oregon

Pollutant	Emission Estimates																Total Facility Emissions Estimates	
	Raw Material Silos		Production Line 2 Hold Tank		Production Line 2 Storage Tanks				Production Line 2 Mix Tank		Production Line 1 Mix Tanks		Production Line 2 Packaging		Total Natural Gas Combustion			
					T8		T4B											
	Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)
PM	0.41	0.14	--	--	--	--	--	--	--	--	--	--	--	--	3.2E-03	0.036	0.41	0.18
PM_{10}	0.41	0.14	--	--	--	--	--	--	--	--	--	--	--	--	3.2E-03	0.036	0.41	0.18
$PM_{2.5}$	0.41	0.14	--	--	--	--	--	--	--	--	--	--	--	--	3.2E-03	0.036	0.41	0.18
NO_X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.13	1.45	0.13	1.45
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.11	1.22	0.11	1.22
VOC	--	--	0.58	0.46	0.63	0.49	0.49	0.37	0.44	1.93	2.55	4.65	1.3E-04	0.10	7.0E-03	0.080	4.69	8.08
SO_2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.3E-03	0.038	3.3E-03	0.038
Pb	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.3E-07	7.3E-06	6.3E-07	7.3E-06
CO_2e	--	--	--	--	--	--	--	--	--	--	--	--	--	--	152	1,744	152	1,744

Table 13

Production Line 1 Mix Tanks HAP Emission Estimates

OR-CAL, Inc.—Junction City, Oregon

Parameter		K1 (Mix Tank 1)	K2 (Mix Tank 2)	K3 (Mix Tank 3)
Diameter of Tank (ft)	(1)	3.83	5.00	5.50
Surface Area of Tank (ft^2)	(a)	11.5	19.6	23.8
Temperature (°F)	(1)	77.0	77.0	77.0
Duration of Operation (hrs/batch)	(1)	5.00	5.00	5.00
Annual Batches (batches/yr)	(1)	730	730	730
Annual Hours of Operation (hrs/yr)	(b)	3,650	3,650	3,650

Pollutant	CAS	Molecular Weight (lb/lb-mol)	Weight Percent in Solution [(2)] (%)	Gas Phase Mass Transfer Coefficient [(c)] (ft/s)	Vapor Pressure [(d)] (psi)	Liquid Mole Fraction [(e)] (lb-mol/ lb-mol)	Partial Pressure [(f)] (psi)	K1 (Mix Tank 1) Evaporation Rate [(g)] (lb/s)	K1 Emissions Estimates Hourly [(h)] (lb/hr)	K1 Emissions Estimates Annual [(i)] (ton/yr)	K2 (Mix Tank 2) Evaporation Rate [(g)] (lb/s)	K2 Emissions Estimates Hourly [(h)] (lb/hr)	K2 Emissions Estimates Annual [(i)] (ton/yr)	K3 (Mix Tank 3) Evaporation Rate [(g)] (lb/s)	K3 Emissions Estimates Hourly [(h)] (lb/hr)	K3 Emissions Estimates Annual [(i)] (ton/yr)	Total Emissions Estimates Hourly (lb/hr)	Total Emissions Estimates Annual (ton/yr)
Benzene	71-43-2	78.11	0.010	2.9E-03	1.84	3.1E-05	5.7E-05	3.1E-08	1.1E-04	2.1E-04	5.3E-08	1.9E-04	3.5E-04	6.5E-08	2.3E-04	4.3E-04	5.4E-04	9.8E-04
Acetaldehyde	75-07-0	44.05	0.040	3.5E-03	17.4	2.2E-04	3.8E-03	1.2E-06	4.3E-03	7.8E-03	2.0E-06	7.3E-03	0.013	2.4E-06	8.8E-03	0.016	0.020	0.037

Notes

°C = degrees Celsius.
°F = degrees Fahrenheit.
ft = feet.
ft^2 = square foot.
ft^3 = cubic foot.
hr = hour.
lb = pound.
lb-mol = pound mole.
mi = mile.
mm Hg = millimeters mercury.
psi = pounds per square inch.
°R = degrees Rankine.
s = seconds.
yr = year.

(a) Surface area of tank (ft^2) = π/4 x (diameter of tank [ft])

(b) Annual hours of operation (hrs/yr) = (duration of operation [hrs/batch]) x (annual batches [batches/hr])

(c) Gas-phase mass transfer coefficient (ft/s) = (0.00438) x (air velocity [mi/hr])$^{0.78}$ x (18 / [molecular weight of HAP lb/lb-mol}])$^{1/3}$ see Reference (3).

Air velocity (mi/hr) = 1.12 (4)

(d) Vapor pressure (psi) = (0.019337 psi/mm Hg) x (10)^([constant A] - [{constant B (°C)} / {([liquid temperature {°F}] - 32) x (5/9) + (constant C [°C])}]); See Reference (5).

Constant A - benzene =	6.906	(6)
Constant B - benzene (°C) =	1211	(6)
Constant C - benzene (°C) =	220.79	(6)
Constant A - acetaldehyde =	8.063	(6)
Constant B - acetaldehyde (°C) =	1637.1	(6)
Constant C - acetaldehyde (°C) =	295.47	(6)

(e) Liquid mole fraction = (weight percent in solution [%])/100 x (average molecular weight solution [lb/lb-mol]) / (molecular weight of HAP [lb/lb-mol])

Average molecular weight solution (lb/lb-mol) = 24.0 (2)

(f) Partial pressure of HAP (psi) = (vapor pressure of constituent [psi]) x (liquid mole fraction [lb-mol/lb-mol])

Table 13 (Continued)

Production Line 1 Mix Tanks HAP Emission Estimates

OR-CAL, Inc.—Junction City, Oregon

(k) Evaporation rate (lb/s) = (molecular weight of HAP [lb/lb-mol]) x (gas-phase mass transfer coefficient [ft/s]) x (surface area of tank [ft^2]) x (partial vapor pressure of HAP [psi]) / ([gas constant {psi · ft³/°R · lb-mol}] x [tank temperature {°F} + 459.67]); see Reference .

Gas constant (psi · ft^3/°R · lb-mol) = 10.7

(l) Hourly emissions estimate (lb/hr) = (evaporation rate [lb/s]) x (3,600 s/hr)

(m) Annual emissions estimate (tons/yr) = (evaporation rate [lb/s]) x (3,600 s/hr) x (annual hours of operation [hr/yr]) x (ton/2,000 lb)

References

(1) See Table 3, Production Mix Tanks—Input Assumptions and Parameters.
(2) Estimate developed based on review of batch records.
(3) "Preferred and Alternative Methods for Estimating Air Emissions from Semiconductor Manufacturing" prepared by Eastern Research Group, Inc. dated February 1999.
(4) The mixing vessel is located inside a building with bay doors and no HVAC system. The bay doors are open allowing for some air flow through the space, though air flow across the tank surface is assumed to be negligible. However for conservatism, MFA assumes a minimum wind speed threshold across the tank surface of 1.12 mph (0.5 m/s) based on EPA guidance documentation for calm wind speeds.
(5) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals." See table reference (b).
(6) AP-42 Chapter 7.1 (November 2019) Table 7.1-3, "Physical Properties of Selected Petrochemicals."

Table 14
Natural Gas Combustion HAP Emission Estimates
OR-CAL, Inc.—Junction City, Oregon

Parameter		Boiler	Natural Gas Area Heaters
Hourly Natural Gas Usage (MMscf/hr)	(1)	2.0E-03	1.3E-03
Annual Natural Gas Usage (MMscf/yr)	(1)	17.9	11.1

HAP	CAS	Emission Factor (2) (lb/MMscf)	Emissions Estimates				Total Emissions Estimates	
			Boiler		Natural Gas Area Heaters			
			Hourly (a) (lb/hr)	Annual (b) (tons/yr)	Hourly (a) (lb/hr)	Annual (b) (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)
Organic Compounds								
Acetaldehyde	75-07-0	4.3E-03	8.8E-06	3.9E-05	5.4E-06	2.4E-05	1.4E-05	6.2E-05
Acrolein	107-02-8	2.7E-03	5.5E-06	2.4E-05	3.4E-06	1.5E-05	8.9E-06	3.9E-05
Benzene	71-43-2	8.0E-03	1.6E-05	7.2E-05	1.0E-05	4.4E-05	2.7E-05	1.2E-04
Ethylbenzene	100-41-4	9.5E-03	1.9E-05	8.5E-05	1.2E-05	5.3E-05	3.1E-05	1.4E-04
Formaldehyde	50-00-0	0.017	3.5E-05	1.5E-04	2.2E-05	9.4E-05	5.6E-05	2.5E-04
Hexane	110-54-3	6.3E-03	1.3E-05	5.6E-05	8.0E-06	3.5E-05	2.1E-05	9.1E-05
Toluene	108-88-3	0.037	7.5E-05	3.3E-04	4.6E-05	2.0E-04	1.2E-04	5.3E-04
Xylenes (mixed isomers)	1330-20-7	0.027	5.6E-05	2.4E-04	3.4E-05	1.5E-04	9.0E-05	3.9E-04
Polycyclic Aromatic Hydrocarbons (PAHs)								
PAHs	PAHs	1.0E-04	2.0E-07	9.0E-07	1.3E-07	5.5E-07	3.3E-07	1.5E-06
Benzo(a)pyrene	50-32-8	1.2E-06	2.5E-09	1.1E-08	1.5E-09	6.7E-09	4.0E-09	1.7E-08
Naphthalene	91-20-3	3.0E-04	6.1E-07	2.7E-06	3.8E-07	1.7E-06	9.9E-07	4.4E-06
Metals								
Arsenic and Compounds	7440-38-2	2.0E-04	4.1E-07	1.8E-06	2.5E-07	1.1E-06	6.6E-07	2.9E-06
Beryllium and Compounds	7440-41-7	1.2E-05	2.5E-08	1.1E-07	1.5E-08	6.7E-08	4.0E-08	1.7E-07
Cadmium and Compounds	7440-43-9	1.1E-03	2.3E-06	9.9E-06	1.4E-06	6.1E-06	3.6E-06	1.6E-05
Chromium and Compounds	7440-47-3	1.4E-03	2.9E-06	1.3E-05	1.8E-06	7.8E-06	4.6E-06	2.0E-05
Cobalt and Compounds	7440-48-4	8.4E-05	1.7E-07	7.5E-07	1.1E-07	4.7E-07	2.8E-07	1.2E-06
Manganese and Compounds	7439-96-5	3.8E-04	7.8E-07	3.4E-06	4.8E-07	2.1E-06	1.3E-06	5.5E-06
Mercury and Compounds	7439-97-6	2.6E-04	5.3E-07	2.3E-06	3.3E-07	1.4E-06	8.6E-07	3.8E-06
Nickel and Compounds	7440-02-0	2.1E-03	4.3E-06	1.9E-05	2.7E-06	1.2E-05	7.0E-06	3.0E-05
Selenium and Compounds	7782-49-2	2.4E-05	4.9E-08	2.2E-07	3.0E-08	1.3E-07	8.0E-08	3.5E-07

Notes

HAP = Hazardous Air Pollutant.
hr = hour.
kg = kilograms.
lb = pound.
MMBtu = million British thermal units.
MMscf = million standard cubic feet.
yr = year.
(a) Hourly emissions estimate (lb/hr) = (emission factor [lb/MMscf]) x (hourly natural gas usage [MMscf/hr])
(b) Annual emissions estimate (tons/yr) = (emission factor [lb/MMscf]) x (annual natural gas usage [MMscf/yr]) x (tons/2,000 lb)

References

(1) See Table 1, Input Process Rates and Parameters.
(2) Oregon DEQ approv ed natural gas combustion emission factors. Assumes heat input less than 10 MMBtu/hr.

Table 15
HAP Emission Estimates Summary
OR-CAL, Inc.—Junction City, Oregon

HAP	CAS	Emission Estimates				Total Facility Emissions Estimates	
		Production Line 1 Mix Tanks		Total Natural Gas Combustion			
		Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)	Hourly (lb/hr)	Annual (tons/yr)
Organic Compounds							
Acetaldehyde	75-07-0	0.020	0.037	1.4E-05	6.2E-05	0.020	0.037
Acrolein	107-02-8	--	--	8.9E-06	3.9E-05	8.9E-06	3.9E-05
Benzene	71-43-2	5.4E-04	9.8E-04	2.7E-05	1.2E-04	5.7E-04	1.1E-03
Ethylbenzene	100-41-4	--	--	3.1E-05	1.4E-04	3.1E-05	1.4E-04
Formaldehyde	50-00-0	--	--	5.6E-05	2.5E-04	5.6E-05	2.5E-04
Hexane	110-54-3	--	--	2.1E-05	9.1E-05	2.1E-05	9.1E-05
Toluene	108-88-3	--	--	1.2E-04	5.3E-04	1.2E-04	5.3E-04
Xylenes (mixed isomers)	1330-20-7	--	--	9.0E-05	3.9E-04	9.0E-05	3.9E-04
Polycyclic Aromatic Hydrocarbons (PAH)							
Polycyclic Aromatic Hydrocarbons (PAH)	PAHs	--	--	3.3E-07	1.5E-06	3.3E-07	1.5E-06
Benzo(a)pyrene	50-32-8	--	--	4.0E-09	1.7E-08	4.0E-09	1.7E-08
Naphthalene	91-20-3	--	--	9.9E-07	4.4E-06	9.9E-07	4.4E-06
Metals							
Arsenic and Compounds	7440-38-2	--	--	6.6E-07	2.9E-06	6.6E-07	2.9E-06
Beryllium and Compounds	7440-41-7	--	--	4.0E-08	1.7E-07	4.0E-08	1.7E-07
Cadmium and Compounds	7440-43-9	--	--	3.6E-06	1.6E-05	3.6E-06	1.6E-05
Chromium and Compounds	7440-47-3	--	--	4.6E-06	2.0E-05	4.6E-06	2.0E-05
Cobalt and Compounds	7440-48-4	--	--	2.8E-07	1.2E-06	2.8E-07	1.2E-06
Manganese and Compounds	7439-96-5	--	--	1.3E-06	5.5E-06	1.3E-06	5.5E-06
Mercury and Compounds	7439-97-6	--	--	8.6E-07	3.8E-06	8.6E-07	3.8E-06
Nickel and Compounds	7440-02-0	--	--	7.0E-06	3.0E-05	7.0E-06	3.0E-05
Selenium and Compounds	7782-49-2	--	--	8.0E-08	3.5E-07	8.0E-08	3.5E-07
Total HAPs		**0.021**	**0.038**	**3.9E-04**	**1.7E-03**	**0.021**	**0.040**
Maximum Single HAP (Acetaldehyde)						**0.020**	**0.037**