

SMAQMD BACT CLEARINGHOUSE

CATEGORY Type:

SULFUR PROCESS UNIT

BACT Category:

BACT Determination Number: 286	BACT Determination Date: 8/5/2021
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Equipment Information

Permit Number: 26887
Equipment Description: UNASSIGNED **EXPIRED**
Unit Size/Rating/Capacity:
Equipment Location: SACRAMENTO AG PRODUCTS DBA THATCHER CO. OF CA, INC
 8625 UNSWORTH AVE SACRAMENTO, CA

BACT Determination Information

District Contact: Jeff Quok Phone No.: (916) 874-4863 email: jquok@airquality.org

ROCs	Standard:	No Standard
	Technology Description:	
	Basis:	
NOx	Standard:	No Standard
	Technology Description:	
	Basis:	Achieved in Practice
SOx	Standard:	50 ppm SOx as SO2 @ 3% O2
	Technology Description:	Scrubber (using soda ash) with demister – 50 ppm SOx as SO2 @ 3% O2
	Basis:	Achieved in Practice
PM10	Standard:	0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
	Technology Description:	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
	Basis:	Achieved in Practice
PM2.5	Standard:	0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
	Technology Description:	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
	Basis:	Achieved in Practice
CO	Standard:	No Standard
	Technology Description:	
	Basis:	
LEAD	Standard:	
	Technology Description:	
	Basis:	

Comments: T-BACT for inorganic HAP/VHAP is scrubber (using soda ash) with demister - 100 ppmvd NH3 @ 3%O2 and 50 ppmvd SOx as SO2 @ 3% O2

Note: NOx and CO emissions from natural gas combustion of the sulfur burner is covered under BACT #221.



BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

EXPIRED

DETERMINATION NO.: 286
DATE: August 5, 2021
ENGINEER: Jeffrey Quok

Category/General Equip Description: Sulfur Process
Equipment Specific Description: Sulfur Process
Equipment Size/Rating: Minor Source BACT
Previous BACT Det. No.: 222

This BACT determination was determined under the project A/C 26887 (Sacramento Ag Products, LLC) for a sulfur process. The sulfur process is an absorption train system that processes sulfur dioxide through packed bed towers to produce aqueous fertilizer product solutions of ammonium thiosulfate, potassium thiosulfate, magnesium thiosulfate, and sodium thiosulfate.

This BACT Determination is a revision of BACT #222 for a sulfur process which was performed under project A/C 25277. Project A/C 25277 was never constructed and an updated design is proposed under A/C 26887. During the redesign the applicant found that the BACT #222 SOx standard of 18 ppmvd SOx as SO₂ @ 3% O₂ was technologically infeasible and hasn't been achieved by similar sulfur processing facilities. The new engineering company A.H Lundberg Systems Ltd. (AHLS) who worked on the revised sulfur process design found that 18 ppm SOx as SO₂ @ 3% O₂ requires a 99.99% removal efficiency, which hasn't been demonstrated by Hydrite, Thatcher, AHLS, or any other company operating or designing sulfur processing systems. Therefore, BACT #222 was rescinded and will be replaced by BACT #286.

BACT/T-BACT ANALYSIS

A: ACHIEVED IN PRACTICE (Rule 202, §205.1a)

The following control technologies are currently employed as BACT/T-BACT for sulfur process by the following air pollution control districts:

US EPA

BACT

Source: [EPA RACT/BACT/LAER Clearinghouse](#)

There are no BACT standards published in the clearinghouse for this category.

T-BACT

There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:

[40 CFR Part 60 – New Source Performance Standards \(NSPS\):](#)

There are currently no 40 CFR, Part 60 NSPS sections that apply to this source category.

[40 CFR Part 61 – National Emission Standards for Hazardous Air Pollutants \(NESHAPS\):](#)

There are currently no 40 CFR, Part 61 NESHAPS that apply to this source category.

[40 CFR Part 63 – NESHAPS for Source Categories \(MACT Standards\):](#)

There are currently no 40 CFR, Part 63 NESHAPS that apply to this source category.

[40 CFR Part 63 Subpart VVVVVV – National Emission Standards for Hazardous Air Pollutants for Chemical Manufacturing Area Sources.](#)

This NESHAP regulates chemical manufacturing process units that use feed stocks or generate products or byproducts of the target HAPs at an area source of HAPs where either the HAPs are present in the feed stocks or are generated or produced in the process and are present in process fluid at concentrations greater than 0.1% for carcinogens or greater than 1.0% for noncarcinogens. The target HAPs are 1,3-butadiene, 1,3-dichloropropene, acetaldehyde, chloroform, ethylene dichloride, hexachlorobenzene, methylene chloride, quinoline, arsenic compounds, cadmium compounds, chromium compounds, lead compounds, manganese compounds, nickel compounds, and hydrazine. The process is not subject to this regulation because it doesn't involve any of the target HAPs.

Air Resources Board (ARB)

BACT

[Source: CARB BACT Clearinghouse](#)

There are no BACT standards published in the clearinghouse for this category.

T-BACT

There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:

[ARB Airborne Toxic Control Measures \(ATCM\):](#)

There are currently no ATCMs that apply to this source category.

Sacramento Metropolitan AQMD

BACT

[Source: SMAQMD BACT Clearinghouse \(BACT #222\)](#)

BACT #222 for a sulfur process was rescinded. This BACT was performed under project A/C 25277 but was never constructed. The BACT was rescinded due to the applicant finding the SOx standard of 18 ppmvd SOx as SO2 @ 3% O2 was technologically infeasible and hasn't been achieved by similar sulfur processing facilities. The new engineering company A.H

Lundberg Systems Ltd. (AHLS) who worked on the revised sulfur process design found that 18 ppm SO_x as SO₂ @ 3% O₂ requires a 99.99% removal efficiency, which hasn't been demonstrated by Hydrite, Thatcher, AHLS, or any other company operating or designing sulfur processing systems. Thatcher has a similar sulfur process permitted in Utah with a SO_x limit of 50 ppm. Therefore, BACT #222 was rescinded and will be replaced by BACT #286.

Sulfur Process^(A)	
VOC	No Standard
NO_x	No Standard
SO_x	Scrubber (using soda ash) with demister – 18 ppm SO _x as SO ₂ @ 3% O ₂
PM₁₀	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
PM_{2.5}	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
CO	No Standard

(A) The SO_x standard was determined to be infeasible and this BACT was rescinded.

T-BACT

Source: [SMAQMD BACT Clearinghouse \(BACT #222\)](#)

Sulfur Process	
Inorganic HAP/VHAP	Scrubber (using soda ash) with demister

RULE REQUIREMENTS:

[Rule 406 – Specific Contaminants \(Amended 12/6/1978\)](#)

This rule limits the emission of sulfur compounds and combustion contaminants.

A person shall not discharge into the atmosphere from any single source of emission equipment whatsoever:

1. Sulfur compounds in any state or combination thereof exceeding in concentration at the point of discharge: sulfur compounds, calculated as sulfur dioxide: 0.2% volume.
2. Combustion contaminants in any state or combination thereof exceeding in concentration at the point of discharge: 0.23 grams per dry standard cubic meter (0.1 grains per dry standard cubic foot) of gas calculated to 12% carbon dioxide at standard conditions.

South Coast AQMD

BACT

Source: SCAQMD BACT Guidelines for Non-Major Polluting Facilities, page 6.
(Last Revised 2/1/2019)

Ammonium Bisulfate and Thiosulfate Production	
VOC	No Standard
NOx	No Standard
SOx	No Standard
PM10	Packed column scrubber with heat exchanger and mist eliminator
PM2.5	No standard
CO	No Standard
Inorganic	Packed column scrubber for NH3

T-BACT

There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:

[Reg IV, Rule 407 – Liquid and Gaseous Air contaminants \(Last amended 4/2/1982\)](#)

A person shall not discharge into the atmosphere from any equipment:

1. Carbon Monoxide (CO) exceeding 2,000 ppm by volume measured on a dry basis, averaged over 15 consecutive minutes.
2. Sulfur compounds which would exist as liquid or gas at standard conditions exceeding 500 ppm, calculated as sulfur dioxide (SO₂) and averaged over 15 consecutive minutes.

The CO standard does not apply to the sulfur process since it does not generate CO emissions. However, the sulfur burner used in the process emits CO from natural gas combustion. All emissions from the sulfur burner natural gas combustion are applicable under SMAQMD BACT #221.

San Diego County APCD

BACT

Source: NSR Requirements for BACT (June 2011)

There are no BACT standards published in the clearinghouse for this category

T-BACT

There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:

[Regulation 4, Rule 53 – Specific Air Contaminants – \(1/22/1997\)](#)

A shall not discharge into the atmosphere from any single source of emission equipment

whatsoever:

1. Sulfur compounds calculated as sulfur dioxide: 0.05 percent, by volume, on a dry basis.
2. Combustion particulates: 0.1 grains per dry standard cubic foot of gas which is standardized to 12% of carbon dioxide by volume (0.23 grains dscm).

Bay Area AQMD

BACT

Source: [BAAQMD BACT Guideline \(5/22/2015\)](#)

There are no BACT standards published in the clearinghouse for this category.

T-BACT

There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:

[Reg 6, Rule 1 – General Requirements](#)

No person shall emit total suspended particulate (TSP) from any source in excess of 343 mg per dscm (0.15 gr per dscf) of exhaust gas volume.

[Regulation 9, Rule 1 – Sulfur Dioxide](#)

This rule establishes emission limits for sulfur dioxide from all sources.

General emission limitation: A person shall not emit from any source, other than a ship, a gas stream containing sulfur dioxide in excess of 300 ppm (dry).

San Joaquin Valley Unified APCD

BACT

Source: [SJVAPCD BACT Clearinghouse](#)

There are no BACT standards published in the clearinghouse for this category.

T-BACT

There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:

[Rule 4201 – Particulate Matter Concentration \(Amended December 12, 1992\)](#)

A person shall not release or discharge into the atmosphere from any single source operation, dust, fumes, or total suspended particulate matter emissions in excess of 0.1 grain per cubic foot of gas at dry standard conditions (0.23 grams per dry standard cubic meter).

[Rule 4801 – Sulfur Compounds \(Amended 12/17/1992\)](#)

A person shall not discharge into the atmosphere sulfur compounds, which would exist as a liquid or gas at standard conditions, exceeding in the concentration at the point of discharge: two-tenths (0.2) percent by volume calculated as sulfur dioxide, on a dry basis averaged over 15 consecutive minutes.

The following control technologies have been identified and are ranked based on stringency:

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
VOC	No Standard – [EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD]
NOx	No Standard – [EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD]
SOx	<ol style="list-style-type: none"> 1. 300 ppmvd [BAAQMD] 2. 500 ppmvd [SCAQMD] 3. 0.2% by volume (2,000 ppmvd) [SMAQMD, BAAQMD] 4. 0.5% by volume (5,000 ppmvd) [SDAPCD] 5. No Standard [EPA, ARB, SDCAPCD, BAAQMD, SJVAPCD]
PM10	<ol style="list-style-type: none"> 1. 0.1 grains per dry standard cubic foot at 12% carbon dioxide by volume [SMAQMD, SDAPCD, SJVAPCD] 2. 0.15 grains per dscf [BAAQMD] 3. Packed column scrubber with heat exchanger and mist eliminator [SCAQMD] 4. No Standard [EPA, ARB]
PM2.5	No Standard – [EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD]
CO	No Standard – [EPA, ARB, SMAQMD, SCAQMD SDCAPCD, BAAQMD, SJVAPCD]
Inorganic HAP/VHAP (T-BACT)	<ol style="list-style-type: none"> 1. Packed column scrubber for NH3 [SCAQMD] 2. No Standard – [EPA, ARB, SMAQMD, SDCAPCD, BAAQMD, SJVAPCD]

The following control technologies have been identified as the most stringent, achieved in practice control technologies:

BEST CONTROL TECHNOLOGIES ACHIEVED		
Pollutant	Standard	Source
VOC	No Standard	EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD
NOx	No Standard	EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD
SOx	300 ppmvd	BAAQMD
PM10	0.1 grains per dry standard cubic foot at 12% carbon dioxide by volume	SMAQMD, SDCAPCD, SJVAPCD
PM2.5	No Standard	EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD
CO	No Standard	EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD

BEST CONTROL TECHNOLOGIES ACHIEVED		
Pollutant	Standard	Source
Inorganic HAP/VHAP (T-BACT)	Packed column scrubber for NH3	SCAQMD

B. TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE (Rule 202, §205.1.b.):

Technologically Feasible Alternatives:

Any alternative basic equipment, fuel, process, emission control device or technique, singly or in combination, determined to be technologically feasible by the Air Pollution Control Officer.

The table below shows the technologically feasible alternatives identified as capable of reducing emissions beyond the levels determined to be “Achieved in Practice” as per Rule 202, §205.1.a.

Pollutant	Technologically Feasible Alternatives
VOC	No other technologically feasible option identified
NOx	No other technologically feasible option identified
SOx	Scrubber (using soda ash) with demister – 50 ppmvd SOx as SO2 @ 3% O2
PM10	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
PM2.5	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
CO	CO emissions are only from natural gas combustion from the sulfur burner which is covered under BACT #221
Inorganic HAP/VHAP (T-BACT) ^(A)	Scrubber (using soda ash) with demister – 100 ppmvd NH3 @ 3%O2 and 50 ppmvd SOx as SO2 @ 3% O2

(A) The only toxic emissions from the sulfur process are from NH3, H2S, and SOx. These pollutants do not contain cancer risk factors and only non-cancer risks. For non-cancer risks T-BACT is triggered with a non-cancer Hazard Index of 1.0 or greater. However, the District requires that any project with a non-cancer Hazard Index 1.0 or greater will be denied. Therefore, T-BACT won't be triggered for this source category as the non-cancer Hazard Index must be below 1.0 to be approved.

NOx Technologically Feasible Alternatives:

The sulfur process does not generate NOx emissions. However, the sulfur burner used in the process emits NOx from natural gas combustion. All emissions from the sulfur burner natural gas combustion are applicable under SMAQMD BACT #221.

SOx, PM10, PM2.5, and Inorganic HAP/VHAP Technologically Feasible Alternatives:

Sacramento Ag Products, LLC is proposing to install an exhaust emission control system consisting of wet scrubbers (using soda ash to absorb SO₂) and demisters. Sacramento Ag Products, LLC is proposing limits of 50 ppmvd for SO_x @ 3% O₂ (based on applicant's proposal), 0.20 grams/dscm @ 12% carbon dioxide at standard conditions for PM (0.0874 grains/dscf) during normal operation (excluding startup/shutdown), and 100 ppmvd NH₃ @ 3% O₂. Therefore, a scrubber (using soda ash) with demister will be considered technologically feasible for SO_x, PM10, PM2.5, and inorganic HAP/VHAP.

During the redesign, the applicant found that the BACT #222 SO_x standard of 18 ppmvd SO_x as SO₂ @ 3% O₂ was technologically infeasible. The new engineering company A.H Lundberg Systems Ltd. (AHLS) who worked on the revised sulfur process design found through research of similar facilities and their own experience designing sulfur systems that 18 ppm SO_x as SO₂ @ 3% O₂ required a 99.99% removal efficiency, which hasn't been demonstrated by Hydrite, Thatcher, AHLS, or any other company operating or designing sulfur processing systems.

CO Technologically Feasible Alternatives:

Sacramento Ag Products, LLC is proposing to install a natural gas fueled sulfur burner for startup and shutdown of the sulfur process. This process is covered under BACT #221 for sulfur burners. This will meet the BACT #221 standard of natural gas fuel or equivalent for sulfur burner – 1,400 ppmvd @ 3% O₂ or 0.3 lb/MMBtu

Inorganic HAP/VHAP (T-BACT):

Sacramento Ag Products, LLC is proposing to install a scrubber (using soda ash) with demister and a limit of 100 ppm for NH₃. Therefore, a scrubber (using soda ash) with demister and a limit of 100 ppm NH₃ standard will be considered T-BACT for HAP/VHAP. Meeting the BACT standard for SO_x is equivalent to T-BACT for SO_x/H₂S.

Cost Effective Determination:

Sacramento Ag Products, LLC is proposing to install the technological feasible controls of a scrubber (using soda ash) with a demister for SO_x, PM10, PM2.5, and inorganic HAP/VHAP, and a natural gas fueled sulfur burner. Since the highest rank options are being selected, no cost effectiveness evaluation is necessary.

C. SELECTION OF BACT/T-BACT:

Based on the review of EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, and SJVAPCD BACT Clearinghouses and cost effectiveness determinations for Technologically Feasible Controls, BACT for VOC, NOx, SOx, PM10, and PM2.5 will be the following:

BACT for Sulfur Process		
Pollutant	Standard	Source
VOC	No Standard	EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD
NOx	No Standard ^(A)	EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD
SOx	Scrubber (using soda ash) with demister – 50 ppm SOx as SO2 @ 3% O2	Technologically feasible
PM10	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)	Technologically feasible
PM2.5	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)	Technologically feasible
CO	No Standard ^(A)	EPA, ARB, SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD

(A) NOx and CO emissions are only from natural gas combustion for the sulfur burner which is covered under BACT #221.

T-BACT for Sulfur Process		
Pollutant	Standard	Source
Inorganic HAP/VHAP (T-BACT)^(A)	Scrubber (using soda ash) with demister – 100 ppmvd NH3 @ 3%O2 and 50 ppmvd SOx as SO2 @ 3% O2	Technologically feasible

(A) The only toxic emissions from the sulfur process are from NH₃, H₂S, and SO_x. These pollutants do not contain cancer risk factors and only non-cancer risks. For non-cancer risks T-BACT is triggered with a non-cancer Hazard Index of 1.0 or greater. However, the District requires that any project with a non-cancer Hazard Index 1.0 or greater will be denied. Therefore, T-BACT won't be triggered for this source as the non-cancer Hazard Index must be below 1.0 to be approved.

APPROVED BY: Brian F Krebs

DATE: 08-05-2021

Attachment A

**BACT Determinations Published by SMAQMD and
SCAQMD**

SMAQMD Rescinded BACT #222

CATEGORY:

SULFUR BURNER & ABSORPTION TRA

BACT Size: Minor Source BACT

SULFUR PROCESS UNIT

BACT Determination Number: 222	BACT Determination Date: 8/15/2019
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Equipment Information

Permit Number: 25277
Equipment Description: SULFUR PROCESS UNIT
Unit Size/Rating/Capacity: Minor Source BACT
Equipment Location: THATCHER COMPANY OF CALIFORNIA
 8625 UNSWORTH AVE
 SACRAMENTO, CA

BACT Determination Information

ROCs	Standard:	
	Technology Description:	No Standard
	Basis:	
NOx	Standard:	15 ppmvd @ 3% O2
	Technology Description:	15 ppmvd @ 3% O2 (excluding start up and shutdown)
	Basis:	Achieved in Practice
SOx	Standard:	18 ppm SOx as SO2 @ 3% O2
	Technology Description:	Scrubber (using soda ash) with demister – 18 ppm SOx as SO2 @ 3% O2
	Basis:	Achieved in Practice
PM10	Standard:	20 grams/dscm @ 12% CO2
	Technology Description:	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
	Basis:	Achieved in Practice
PM2.5	Standard:	20 grams/dscm @ 12% CO2
	Technology Description:	Scrubber (using soda ash) with demister – 0.20 grams/dscm @ 12% carbon dioxide at standard conditions (0.0874 grains/dscf)
	Basis:	Achieved in Practice
CO	Standard:	
	Technology Description:	No Standard
	Basis:	
LEAD	Standard:	
	Technology Description:	No Standard
	Basis:	

Comments: T-BACT is Scrubber (using soda ash) with demister

District Contact: Jeff Quok Phone No.: (916) 874-4863 email: jquok@airquality.org

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

10-20-2000 Rev. 0

Equipment or Process: Ammonium Bisulfate and Thiosulfate Production

Rating/Size	Criteria Pollutants					Inorganic
	VOC	NOx	SOx	CO	PM ₁₀	
All					Packed Column Scrubber with Heat Exchanger and Mist Eliminator (1990)	Packed Column Scrubber for NH ₃ (1990)

* Means those facilities that are minor facilities as defined by Rule 1302 - Definitions