Application to Modify PTI 38-06
Powdered Egg Manufacturing

Crimson Holdings, LLC
Adrian Michigan

Project No. 220602
May 19, 2023

fishbeck
Engineers | Architects | Scientists | Constructors

EGLE

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY

PERMIT TO INSTALL APPLICATION

For authority to install, construct, reconstruct, relocate, or modify process, fuel-burning or refuse burning equipment and/or control equipment. Permits to install are required by administrative rules pursuant to Section 5505 of 1994 PA

FOR EGLE USE
APPLICATION NUMBER

Please type or print clearly. The "Application Instructions" and "Information Required for an Administratively Complete Permit to Install Application" are available on the Air Quality Division (AQD) Permit Web Page.
Please call the AQD at 517-899-6252. if you have not been contacted within 15 days of your application submittal.

1. FACILITY CODES: State Registration Number (SRN) and North American Industry Classification System (NAICS)

SRN: E 8 1 1 7 NAICS: 1 1 2 1 2 0

2. APPLICANT NAME: (Business License Name of Corporation, Partnership, Individual Owner, Government Agency)
Crimson Holdings, LLC

3. APPLICANT ADDRESS: (Number and Street) | MAIL CODE:
1336 East Maumee Street

CITY: (City, Village or Township)	STATE:	ZIP CODE:	COUNTY:
Adrian	MI	49221	Lenawee

4. EQUIPMENT OR PROCESS LOCATION: (Number and Street – if different than Item 3)

CITY: (City, Village or Township)	ZIP CODE:	COUNTY:

5. GENERAL NATURE OF BUSINESS:
Powdered Egg Manufacturing

6. EQUIPMENT OR PROCESS DESCRIPTION: (A Description MUST Be Provided Here. Include Emission Unit IDs. Attach additional sheets if necessary; number and date each page of the submittal.)
Spray dryer used in manufacturing powdered eggs including a drying chamber, powder conveyor, pneumatic conveyor, fabric filter product collector and cyclonic product collector. The purpose of this application is to include a new packed-bed scrubber to control odors from the spray dryer.

7. REASON FOR APPLICATION: (Check all that apply.)
- ☐ INSTALLATION / CONSTRUCTION OF NEW EQUIPMENT OR PROCESS
- ☐ RECONSTRUCTION / MODIFICATION / RELOCATION OF EXISTING EQUIPMENT OR PROCESS – **DATE INSTALLED:**
- ☒ OTHER – DESCRIBE NEW SCRUBBER

8. IF THE EQUIPMENT OR PROCESS THAT WILL BE COVERED BY THIS PERMIT TO INSTALL (PTI) IS CURRENTLY COVERED BY ANY ACTIVE PERMITS, LIST THE PTI NUMBER(S): 38-06

9. DOES THIS FACILITY HAVE AN EXISTING RENEWABLE OPERATING PERMIT (ROP)? ☒ NOT APPLICABLE ☐ PENDING APPLICATION ☐ YES
PENDING APPLICATION OR ROP NUMBER:

10. AUTHORIZED EMPLOYEE:	TITLE:	PHONE NUMBER: (Include Area Code)
Daniel Hofbauer	Plant Manager	517.208.0904
SIGNATURE: Daniel Hofbauer	DATE:	E-MAIL ADDRESS: dhofbauer@crimsonhldg.com
11. CONTACT: (If different than Authorized Employee. The person to contact with questions regarding this application)		PHONE NUMBER: (Include Area Code)
Lillian Woolley, PE		248.324.4785
CONTACT AFFILIATION: Fishbeck		E-MAIL ADDRESS: llwoolley@fishbeck.com

12. IS THE CONTACT PERSON AUTHORIZED TO NEGOTIATE THE TERMS AND CONDITIONS OF THE PERMIT TO INSTALL? ☒ YES ☐ NO

FOR EGLE USE ONLY - DO NOT WRITE BELOW

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203:	PERMIT NUMBER:
DATE PERMIT TO INSTALL APPROVED:	SIGNATURE:
DATE APPLICATION / PTI VOIDED:	SIGNATURE:
DATE APPLICATION DENIED:	SIGNATURE:

A PERMIT CERTIFICATE WILL BE ISSUED UPON APPROVAL OF A PERMIT TO INSTALL

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Engineers | Architects | Scientists | Constructors

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List of Abbreviations/Acronyms

acfm	actual cubic feet per minute
AER	allowable emission rate
AQD	Air Quality Division
BACT	Best Available Control Technology
Btu	British thermal units
Btu/hr	Btus per hour
CAA	Clean Air Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
DAF	dissolved air floatation
DFA	Dairy Farmers of America
°F	degrees Fahrenheit
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EU	emission unit
ft^2	square feet
gph	gallons per hour
H_2O	water
H_2S	hydrogen sulfide
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HC	hydrocarbon
IRSL	Initial Risk Screening Level
ITSL	Initial Threshold Screening Level
lb	pound(s)
lb/hr	pounds per hour
lb/MMBtu	pounds per million Btus
MDARD	Michigan Department of Agriculture & Rural Development
MMBtu/hr	million Btus per hour
Na_2S	sodium sulfide
NAAQS	National Ambient Air Quality Standards

$NaHSO_3$	sodium bisulfite
NaOH	sodium hydroxide
NH_3	ammonia
$(NH_4)_2SO_4$	ammonium sulfate
NO_X	nitrogen oxides
NOMP	Nuisance Odor Management Plan
NSPS	New Source Performance Standards
NSR	New Source Review
O_3	ozone
O&M	operation and maintenance
PM	particulate matter
$PM_{2.5}$	fine particulate matter less than 2.5 microns
PM_{10}	fine particulate matter less than 10 microns
PSD	Prevention of Significant Deterioration
PTI	Permit to Install
SCC	Source Classification Code
SDS	Safety Data Sheet(s)
SO_2	sulfur dioxide
SO_4	sulfate
TAC	toxic air contaminant
T-BACT	Best Available Control Technology for Toxics
tpy	tons per year
µm	micrometer(s)
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WWTP	wastewater treatment plant

1.0 Executive Summary

In December 2021, Crimson Holdings, LLC purchased an existing Dairy Farmers of America (DFA) facility in Adrian, Michigan. The facility previously produced and stored powdered milk, now it produces powdered eggs; the processes are very similar. In a letter dated December 7, 2021, Crimson Holdings notified the Michigan Department of Environment, Great Lakes, and Energy (EGLE) of the change in ownership and the switch to using liquid eggs as a raw material. Fishbeck prepared a Meaningful Change Analysis as described in *Permit Exemption for Changes in a Process or Process Equipment That Are Not a Meaningful Change or a Meaningful Increase In Toxic Air Contaminants* (AQD-025) or Rule 285(2)(b) and demonstrated that no meaningful change occurs when switching from manufacturing powdered milk to manufacturing powdered eggs.

Fishbeck has been retained by Crimson Holdings, to prepare and submit this Application to Modify the existing Air Use Permit to Install (PTI) 38-06 (Appendix 1). The Crimson Holdings facility is located at 1336 East Maumee Street Adrian, Michigan. Figure 1 is a Site Location Map, Figure 2 presents a Plant Layout, and Figure 3 provides a Site Plan. EGLE has requested that Crimson Holdings incorporate a Nuisance Odor Minimization Plan (NOMP) into its PTI for the existing EU-SPRAYDRYER manufacturing process. It is important to note that the existing EU-SPRAYDRYER equipment has not been modified; Crimson Holdings is simply incorporating its NOMP into its PTI.

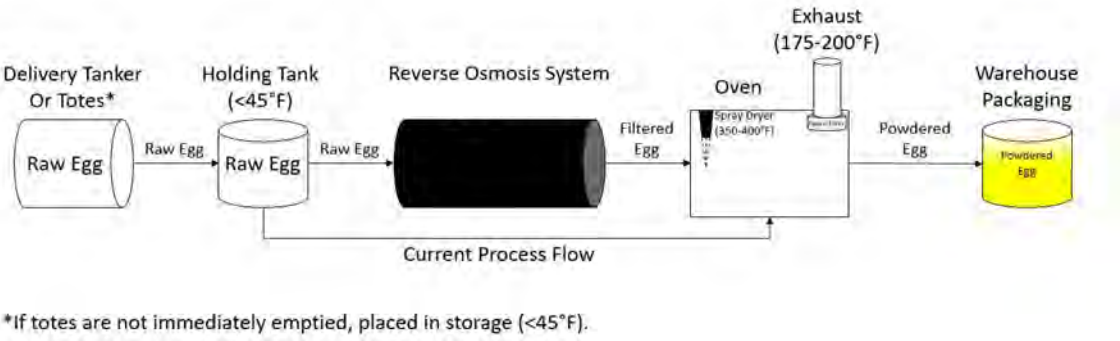
2.0 Process Overview

2.1 Process Description

For several years, DFA operated a facility to produce powdered milk, which was permitted under PTI 38-06. Liquid eggs are shipped to the site in tankers, totes, and barrels. Once a tanker, tote, or barrel is emptied, the liquid eggs are transferred to holding tanks, which vent inside the facility. If totes cannot be received immediately, they are stored at a temperature less than 45°F until they can be emptied. Crimson Holdings has installed a reverse osmosis system to remove water from the liquid egg product before it is transferred to the spray dryer which has reduced the loading on the dryer system The liquid eggs may be pasteurized before entering the spray dryer. The spray dryer atomizes the liquid eggs into a hot air stream (350-400°F). By controlling the size of the droplets, air temperature, and air flow, it is possible to evaporate nearly all the moisture from the eggs at relatively low temperatures. After the eggs are dried into powder, the powder is cooled through a pneumatic powder conveyor/cooler and associated cyclone. The spray dryer and pneumatic cooler cyclone each have a dedicated fabric filter baghouse to reduce particulate emissions and to ensure that food product is not deposited around the plant where it could attract rodents or other pests. The powder flows through the dryer and the conveying system in the same way that powdered milk would. The powdered eggs are then bagged and shipped for use in pet food.

The spray dryer is fired with burners which are rated at approximately 14 million Btus per hour (MMBtu/hr). The facility operates three separate boilers (rated at 8.37 MMBtu/hr, 14.645 MMBtu/hr, and 20.412 MMBtu/hr, respectively) to provide steam and heat. The facility also has some small heaters (<100,000 Btu/hr) in a few areas of the plant. Due to their nominal size, this combustion equipment could be considered exempt under Michigan Rule 282(2)(b)(i). Appendix 2 provides a diagram of the spray dryer that was included in the original PTI Application.

Graphic 1 – Process Flow Diagram



*If totes are not immediately emptied, placed in storage (<45°F).

The facility is also equipped with an ammonia refrigeration system which is regulated under the Risk Management Plan. The facility has a compliant RMP that is registered with USEPA. The system has approximately 8800 pounds of ammonia and the largest pressure vessel is 750 gallons.

2.2 Air Pollution/Odor Control

The facility is equipped with add-on control equipment to address both emissions and odors.

2.2.1 Fabric Filter Dust Collector

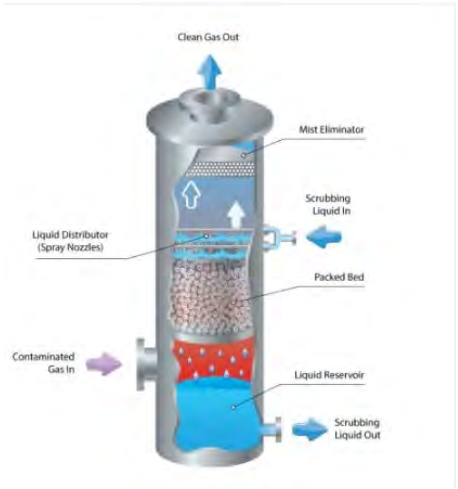
A fabric filter dust collector is an integral part of the spray dryer and the system. The fabric filter dust collector was manufactured by Marriott Walker as a part of the spray dryer. It is rated at approximately 30,000 cubic feet per minute (cfm) Additional information on the spray dryer and its relationship to the fabric filter dust collector is included in Appendix 2. The baghouse has 552 bags that are 6 inches in diameter and 120 inches long for a total area of 8,671 square feet (ft^2). With air flow of approximately 30,000 cfm the air to cloth ratio is 3.2.:1. The baghouse has an automatic reverse pulse jet cleaning system that returns collected material to the drier. Clean air exhausts through the inside of the bags. Additional information on the bags is provided in Appendix 3. There is a baghouse within the conveying system that exhausts out the elevated structure on the roof. It is rated at approximately 8,000 cfm and was considered exempt under Rule 284(2)(k).

2.2.2 Packed-bed Scrubber

Packed-bed scrubbers are commonly used for gas absorption. This type of scrubber spreads the liquid over packing material to provide a large surface area for liquid/gas interaction. Packed-bed scrubbers are classified according to the relative direction of the gas and liquid flows. In the counter-current design, the liquid is introduced at the top of the tower using sprays or weirs and flows downward over the packing material. The contaminated gas stream enters at the bottom of the tower and flows upward through the packing.

A packed-bed scrubber will be installed to control odors from the spray dryer. The proposed scrubber is manufactured by Tri-Mer and additional information on the system is included in Appendix 4. A fact sheet from the U.S. Environmental Protection Agency (USEPA) is also included in Appendix 5. In wet scrubbing processes used for gaseous control, a liquid is used to remove pollutants from an exhaust stream. The removal of pollutants in the gaseous stream is done by absorption. Wet scrubbers used for this type of pollutant control are often referred to as absorbers. Most absorbers have removal efficiencies in excess of 90%, depending on pollutant absorbed.

Graphic 2 – Packed-bed Scrubber



Packed-bed scrubbers are columns filled with packing materials that provide a large surface area to facilitate contact between the liquid and gas. The driving force of the absorption process is related to the amount of soluble gas in the gas stream and the concentration of the solute gas in the liquid film that comes in contact with the gas. The absorbing material is made up of a solution of either acid solution or basic solution that reacts with the pollutant being absorbed to reduce the concentration. By changing the chemical composition of the absorbing solution, the charge can be changed. One of the scrubber stages proposed at Crimson Holdings will use sulfuric acid to control ammonia, amines, and other nitrogenous compounds by absorption in the acidic solution. The sulfuric acid will react with these compounds to create compounds that will not be odorous. For example:

ammonia + sulfuric acid → ammonium sulfate

$$2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$$

Ammonium sulfate, and other compounds which do not have an odor, will result from the reaction with sulfuric acid.

The second stage of the packed-bed scrubber will use sodium hydroxide to control acid gas emissions including sulfur dioxide, sulfides, nitric acid, and similar compounds. A caustic solution (sodium hydroxide, NaOH) is the most common scrubbing liquid used for acid-gas control (e.g., hydrocarbons[HC], sulfur dioxide [SO_2] , or both).

Hydrogen sulfide + sodium hydroxide → sodium sulfide + water

$$H_2S + 2NaOH \rightarrow Na_2S + 2H_2O$$

Sodium sulfide and water will result from reacting hydrogen sulfide with sodium hydroxide. Sulfur dioxide will also react with sodium hydroxide, resulting in sodium bisulfite ($NaHSO_3$). Carbonyl sulfide reacts with sodium hydroxide, resulting in sodium carbonate, sodium hydrosulfide and water. Any organic acids will be neutralized in the sodium hydroxide solution to form water and an ionic compound or salt. For example, acetic acid reacts with sodium hydroxide to form sodium acetate and water. Sodium hypochlorite (bleach) is unnecessary in the second stage though it will give the exhaust a sweeter, cleaner smell.

The packed-bed scrubber is also equipped with a mist eliminator. The mist eliminator is necessary to ensure that there is not a carryover of the solution out of the stack where it could create a haze or cause fall-out. The mist eliminator will control droplets up to 20 micrometers (µm) at an efficiency better than 99%.

2.2.3 Odor Neutralizer

The scrubber will take approximately 8 months to be installed. Until the scrubber is operational, Crimson Holdings will utilize an odor neutralizer to mitigate odors. Crimson Holdings purchased a fogging system that can be used to introduce an odor neutralizer to the exhaust system. The system sprays the solution with water and the ratio of solution to water can vary. The site has tested ratios between 53:1 to 109:1 with total diluted solution used between 12 and 15 gallons per hour (gph). The spray system uses between 15 and 20 cfm air to assist in the atomizing the solution.

Crimson Holdings has investigated different neutralizers and recently elected to use a Chemtreat product, which seemed to give the best results during testing. The Safety Data Sheet (SDS) for this product and additional information is provided in Appendix 6.

The Chemtreat odor neutralizer used essential oils used in odor control products are extracts from many different fruits, vegetables, and other plant material. There are thousands of these oils available and many find their way into perfumes and fragrances, solvents, flavor enhancers, cooking oils, and other uses. However, there are a very limited number of these oils that are appropriate and effective for odor elimination. It is the choice of these oils and the chemical properties they display that makes one product more effective than another.

The oils used for odor control display certain critical chemical properties that allow an oil to have a physical or chemical effect on odorous compounds. The effect is dependent on the various chemical functional groups that an oil may have. For example, the oil may have an ester group or an alcohol group, it may be an aldehyde, or it may be strictly an oil. These functionalities are what make an oil effective at eliminating an odor. The effectiveness of any odor control product is directly dependent on how well the essential oils are chosen and blended to effect the correct chemical or physical reaction on those odorous compounds.

Crimson Holdings' goal in selecting essential oils to mitigate odors is to effect change in the odor so that the odor is no longer detectable by the human nose. Keep in mind that the nose is more sensitive to odors than most testing equipment available. This is especially true with compounds that have a low odor threshold. Essential oils in use by Chemtreat can effect change in the odorous compounds by:

- Modifying the shape (chemical structure) of the odor molecule before it reaches the nose
- Modifying the numbers and intensity of the molecules reaching the nose
- Modifying the perception of the odor.

There have been numerous studies carried out that claim a number of reactions occur to neutralize odors. The following five reactions have been identified:

- Absorption of the malodor
- Solubilizing the odorous compounds
- Counteracting odor through antagonistic pairing
- Acidic malodors plus an alcohol can yield an ester
- Adsorption of the malodor

Though all five reactions have been reported, the degree to which each contributes is debatable. We believe the first three reactions to be the primary contributors to the elimination of malodor. Although the last two can certainly occur, the degree of the contribution to odor elimination is very much smaller than the other reactions. The actual chemistry involved utilizes the unique characteristics of each oil in the product to optimize the simple reactions. The result is complete odor elimination without harmful byproducts, masking, or the use of hazardous chemicals. While there are those who are under the impression that all essential oil technologies are simply masking agents or perfumes, not all essential oils are fragrant or are used as fragrances. NovoAir is a blend of oils

that, though having some fragrance, are not suitable to mask an odor. The products simply do not contain a high enough level of fragrance to do so.

Masking agents, on the other hand, are usually made up of one distinct fragrance that is readily detectable and increases in intensity as the dosage is elevated. Masking agents add to the overall odor intensity by introducing an odor greater than the offending malodor often resulting in an even greater odorous condition. The Chemtreat odor neutralizer was specifically selected because it neutralizes odor and does not mask it. If the odor of the essential oils in use becomes evident, it is possible to adjust the dilution ratio to minimize the essential oils odor. It may also be possible to ask Chemtreat to adjust the mix of materials to avoid smelling the essential oils or to eliminate fallout.

There are also two other odor neutralizers which could be potentially used at Crimson Holdings. The PathoSans Pathocide odor neutralizer includes a small amount of hypochlorous acid and can be applied with the current system at a 53:1 dilution ratio at 15 gph. The CupriDyne odor neutralizer includes cuprous iodide, sulfamic acid, and potassium bicarbonate. These two odor neutralizers react with the odorous compounds and neutralize them.

2.2.4 Odor Control Equipment for the WWTP

Fugitive odors from the facility's wastewater treatment plant (WWTP) were previously identified by EGLE staff; Crimson Holdings has addressed these odors. Crimson Holdings has also operated the dissolved air floatation (DAF) a new schedule and has increased the frequency at which the sludge is moved to the sludge storage to further reduce the possibility of odors. While the sludge storage tank already had a carbon filter, the casing was replaced as was the stack for the tank. Information on operation and maintenance (O&M) of the WWTP is included in the NOMP.

2.2.5 Nuisance Odor Management Plan

EGLE requested a Nuisance Odor Minimization Plan (or NOMP) and Crimson Holdings offered to apply for a PTI incorporating the new NOMP. The NOMP was previously submitted to EGLE for approval. Crimson Holdings has incorporated improvements made in odor management as well as some O&M practices to ensure odors are adequately controlled. Crimson Holdings received EGLE comments on the proposed NOMP and will revise it to address these comments; updates will be provided when they are available.

3.0 Regulatory Review

3.1 Michigan Air Pollution Control Regulations

3.1.1 Rule 201 – PTI Requirements

Any process or process equipment installed after August 15, 1967, which may emit an air contaminant requires a PTI prior to installation, construction, reconstruction, relocation, alteration, or modification unless specifically exempt. Installation of the scrubber to control odors would be exempt from permit to install requirements. However, the proposed monitoring associated with the scrubber and the NOMP must be incorporated into the PTI.

3.1.2 Rules 224 to 230 – Air Toxics Requirements

3.1.2.1 Rule 224 – T-BACT Requirement for New and Modified Sources of Air Toxics

Rule 224 requires that emissions of toxic air contaminants (TACs) from a new or modified source not exceed the maximum allowable emission rate that results from the application of the best available control technology for toxics (T-BACT).

It should also be noted that the definition of air pollution in Rule 101(h) and in 1994 PA 451, MCL 324.5501 to 324.5542, states that *Air pollution does not mean those usual and ordinary odors associated with a farm operation if the person engaged in the farm operation is following generally accepted agricultural and management practices*. While Crimson Holdings may not be considered a *farm operation*, the facility is an agricultural processor and has applied for recognition from the Michigan Department of Agriculture & Rural Development (MDARD).

In addition, the definition of toxic air contaminant in Rule 120(f)(v) specifically excludes *Animal or plant materials, including extracts and concentrates thereof, used as ingredients in food products or dietary supplements in accordance with applicable regulations of the United States food and drug administration*.

Only liquid eggs are dried in the spray dryer; no additional materials are added. The facility has an excellent O&M Plan and has voluntarily adopted additional Food and Drug Administration safety standards as outlined in the NOMP.

It should be noted that the odor neutralizer materials are added to the exhaust and have also been evaluated,

A T-BACT analysis, including applicable exemptions, is provided in Section 5.1.

3.1.2.1 Rules 225 To 230 – Health-Based Screening Level Requirement for New or Modified Sources of Air Toxics

Rule 225 requires that emissions of TACs not exceed the maximum allowable emission rate that results in a predicted maximum ambient impact above the Initial Threshold Screening Level (ITSL), the Initial Risk Screening Level (IRSL), or both.

For TACs which do not qualify for the Rule 226 exemptions, Rule 227 indicates that compliance with the health-based screening level provisions of Rule 225 can be determined by any of the following:

- Pursuant to Rule 227(1)(a), the emission rate of each TAC is not greater than the rates determined from the algorithms in Table 21 [of Rule 227].
- Pursuant to Rule 227(1)(b), the emission rate of each TAC is not greater than the rate determined from the Ambient Impact Ratio matrix screening methodology in Table 22 [of Rule 227] or determined by any other screening method approved by EGLE.
- Pursuant to Rule 227(1)(c), the maximum ambient impact of each TAC is less than the applicable screening level determined using the maximum hourly emission rate in accordance with the air quality modeling provisions of Rule 240, 241, or both.

A dispersion modeling analysis for TACs is provided in Section 6.

3.1.3 Rule 301 – Standards for Density of Emissions

Rule 301 establishes limitations for the density of particulate emissions. The proposed changes are not expected to have any effect on the ability to comply with the visible emission limitations of Rule 301. Rule 301 limits visible emissions as follows:

- A 6-minute average of 20% opacity, except for one 6-minute average per hour of not more than 27% opacity.
- A limit specified by an applicable federal Standard for the Performance of NSPS. No such limit applies to the powdered egg manufacturing process
- A limit specified as a condition of a PTI or Permit to Operate.

Crimson Holdings is confident that the powdered egg manufacturing process will comply with the applicable opacity limitations.

3.1.4 Rule 331 – Emission of Particulate Matter

Rule 331 stipulates that exhaust systems serving material handling equipment not otherwise listed in Table 31 (of Rule 331) shall not exceed an emission rate of 0.10 pound (lb) of particulate per 1,000 lb of exhaust gas. The

existing PTI further limits emissions to 0.04 lb/1000 lb exhaust; Crimson Holdings is not proposing to change this emission limit.

3.1.5 Rule 702 – VOC BACT

New sources of volatile organic compounds (VOCs) are subject to Rule 702 which requires an emission limitation based upon the application of BACT. New sources are defined in Rule 701 as:

> *... any process or process equipment which is either placed into operation on or after July 1, 1979, or for which an application for a Permit to Install, pursuant to the provision of Part 2 of these rules, is made to the department on or after July 1, 1979, or both, except for any process or process equipment which is defined as an existing source pursuant to R336.1601 (Rule 601).*

Good combustion will meet the requirements of Rule 702 for the combustion equipment as it did when the equipment was new. Proper operation of the spray dryer will ensure that VOC emissions will remain low. Additional information is included in Section 5.2.

3.1.6 Rule 901 – Nuisance Odors and Dust

Rule 901 prohibits the emissions of air contaminants in quantities that cause either:

- Injurious effects to human health or safety, animal life, plant life of significant economic value, or property.
- Unreasonable interference with the comfortable enjoyment of life and property.

Crimson Holdings is confident that implementation of the new NOMP will ensure compliance with Rule 901.

3.1.7 Part 18 – Prevention of Significant Deterioration

The primary provisions of the Prevention of Significant Deterioration (PSD) Program require that new major stationary sources and major modifications at existing major stationary sources be carefully reviewed prior to onsite construction to ensure compliance with the National Ambient Air Quality Standards (NAAQS), the applicable PSD Increment provisions, and the requirement to apply Best available Control Technology (BACT) on the project's significant emission increases of New Source Review (NSR)-regulated pollutants. The PSD Program also requires evaluation of potential visibility impacts to federally designated Class I areas, evaluation of air quality impacts as a result of secondary growth associated with the project, and a minimum 30-day public comment process.

The Crimson Holdings facility is located in Lenawee County, which is currently in attainment with all NAAQS, except ozone (O_3) and SO_2. Both nitrogen oxides (NO_X) and VOCs are regulated for controlling O_3 formation in the ambient air because they both participate in ambient photochemical reactions that result in O_3.

3.1.8 EGLE Dispersion Modeling Guidance

EGLE, Air Quality Division (AQD) Policy and Procedure AQD-22, *Dispersion Modeling Guidance for Federally Regulated Pollutants*, addresses when dispersion modeling is required as part of a PTI application. This Policy and Procedure is intended to ensure that projects do not interfere with the NAAQS or PSD Increment. Pursuant to EGLE guidelines, this determination must be made for both *major source* and *minor source* applications.

Crimson is proposing to reduce the existing particulate matter (PM) and fine PM less than 10 microns (PM_{10})emission rates. As a result, no air dispersion modeling was included for PM_{10} or fine PM less than 2.5 microns ($PM_{2.5}$).

3.2 Federal Regulations

3.2.1 40 CFR 60 Subpart Dc – NSPS

The New Source Performance Standards (NSPS) require that new emission sources emit less pollutants than existing sources. The *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating*

Units 40 CFR 60 Subpart Dc (NSPS) applies to boilers manufactured after 1984 which are larger than 10 MMBtu/hr in size. Of the three boilers at Crimson Holdings, only the boiler rated at 20.412 MMBtu/hr is subject to the NSPS because of its date of installation. As all three boilers fire only natural gas, only monthly fuel records are needed to demonstrate compliance with the NSPS. No provisions of Subpart Dc apply to the operation of the dryer.

4.0 Emission Characteristics

Operation of the powdered egg manufacturing process results in criteria pollutants and TAC emissions.

4.1 Criteria Pollutant Emissions

When the facility was originally permitted, particulate matter (PM) emissions from the spray dryer were limited to 0.04 lb/1,000 lb exhaust and 10.2 pounds per hour (lb/hr) of fine PM less than 10 microns (PM_{10}). Testing is recently conducted and emissions are even lower than the permitted amount. Stack test results are completed included in Appendix 7. VOC emissions were measured at 0.88 lb/hr. For the purposes of this Application, the emissions were doubled to 1.76 lb/hr or 7.7 tons per year (tpy) to approximate worst case emissions. While the testing summary in Appendix 7 describes an exhaust flow rate of less than 30,000 actual cubic feet per minute (acfm), *worst case* emissions were calculated at 30,000 acfm. Combustion emissions from the dryer were estimated using the emission factors from USEPA WebFIRE for Source Classification Code (SCC) 1-02-006-02 for natural gas-fired boilers between 10 and 100 MMBtu/hr. An emissions summary is provided in Table 1. Emissions from the dryer are presented in Table 2. Table 3 provides a summary of TAC emissions from the spray dryer. Combustion emissions from the dryer are summarized in Table 4.

If using the odor neutralizer, any emissions resulting from use of the neutralizer must also be considered. Complete analyses of the neutralizer materials were provided by Chemtreat and the other odor neutralizer manufacturers; this information is presented in Appendix 6. The sum of the Chemtreat components are greater than 100%. While Chemtreat has offered that the material only contains 4% organic material, of which only 0.312% is VOCs, Crimson Holdings is assuming that the entire 4% may be emitted as VOCs.

All three proposed chemical neutralizers were evaluated and their SDS are presented in Appendix 6.

4.2 HAP and TAC Emissions

On June 21, 2022, hazardous air pollutant (HAP) and TAC emissions from the spray dryer were measured, the results are summarized in Appendix 7. While testing was performed for ammonia and a number of sulfides and amines, only ammonia and carbonyl sulfide were detected. Table 3 provides a summary of TAC emissions from the spray dryer. TAC emissions from the combustion equipment were estimated using USEPA WebFIRE, based on emission factors for SCC 1-02-006-02 for natural gas-fired boilers between 10 and 100 MMBtu/hr. TAC emissions from the spray dryer combustion equipment are summarized in Table 5. Odor neutralizer TAC emissions are presented in Table 6.

5.0 BACT Analysis

Facilities permitted in Michigan must comply with state-specific requirements for T-BACT and VOC BACT.

5.1 T-BACT Analysis

Michigan Rule 224 requires the application of T-BACT for new or modified process or process equipment which emits a TAC. As described in Section 3.1.2.1, Rule 224(2) provides certain exemptions from the requirement of T-BACT. While engines, turbines, boilers, and process heaters with heat input capacities up to 100 MMBtu/hr and which fire natural gas, diesel, or biodiesel are exempt from T-BACT, not all of the combustion equipment has a

stack that is at least 1.5 times the building height. As a result, we must describe T-BACT as proper use of the packed-bed scrubber and a good maintenance program described in NOMP.

5.2 VOC BACT Analysis

New sources of VOC are subject to Rule 702, which requires an emission limitation based upon the application of BACT. Rule 702 requires a new source of VOC to meet all the provisions in the following Subrules:

a) *The maximum allowable emission rate listed by the department on its own initiative or based upon the application of the best available control technology.*
b) *The maximum allowable emission rate specified by a new source performance standard promulgated by the USEPA under authority enacted by Title I, Part A, Section 111 of the Clean Air Act (CAA), as amended, 42 U.S.C. §7413.*
c) *The maximum allowable emission rate specified as a condition of a permit to install or a permit to operate.*
d) *The maximum allowable emission rate specified in Part 6 of these rules which would otherwise be applicable to the new source except for the date that the process or process equipment was placed into operation or for which an application for a permit to install, under the provisions of Part 2 of these rules, was made to the department. If the Part 6 allowable emission rate provides for a future compliance date, then the future compliance date shall also be applicable to a new source pursuant to this subdivision.*

Emissions from the spray dryer are low and will be controlled by the new scrubber. Proper use of the scrubber will be VOC BACT under Rule 702(a).

6.0 Air Quality Modeling and Air Toxic Evaluation

EGLE Rule 225 requires that the predicted maximum ambient impact from emission of TACs from new and modified sources not exceed health-based screening levels. The screening level for a TAC is the maximum allowable concentration in the ambient air, at the fence line surrounding the source's property, averaged over a specified period of time. The TAC emission rates from odor neutralizer, combustion and spray dryer were compared to the allowable emission rates (AERs) determined using the algorithms in Table 21 [of Rule 227]. The algorithms in Table 21 calculate a maximum hourly emission rate, as well as an AER, in the same units as the screening level.

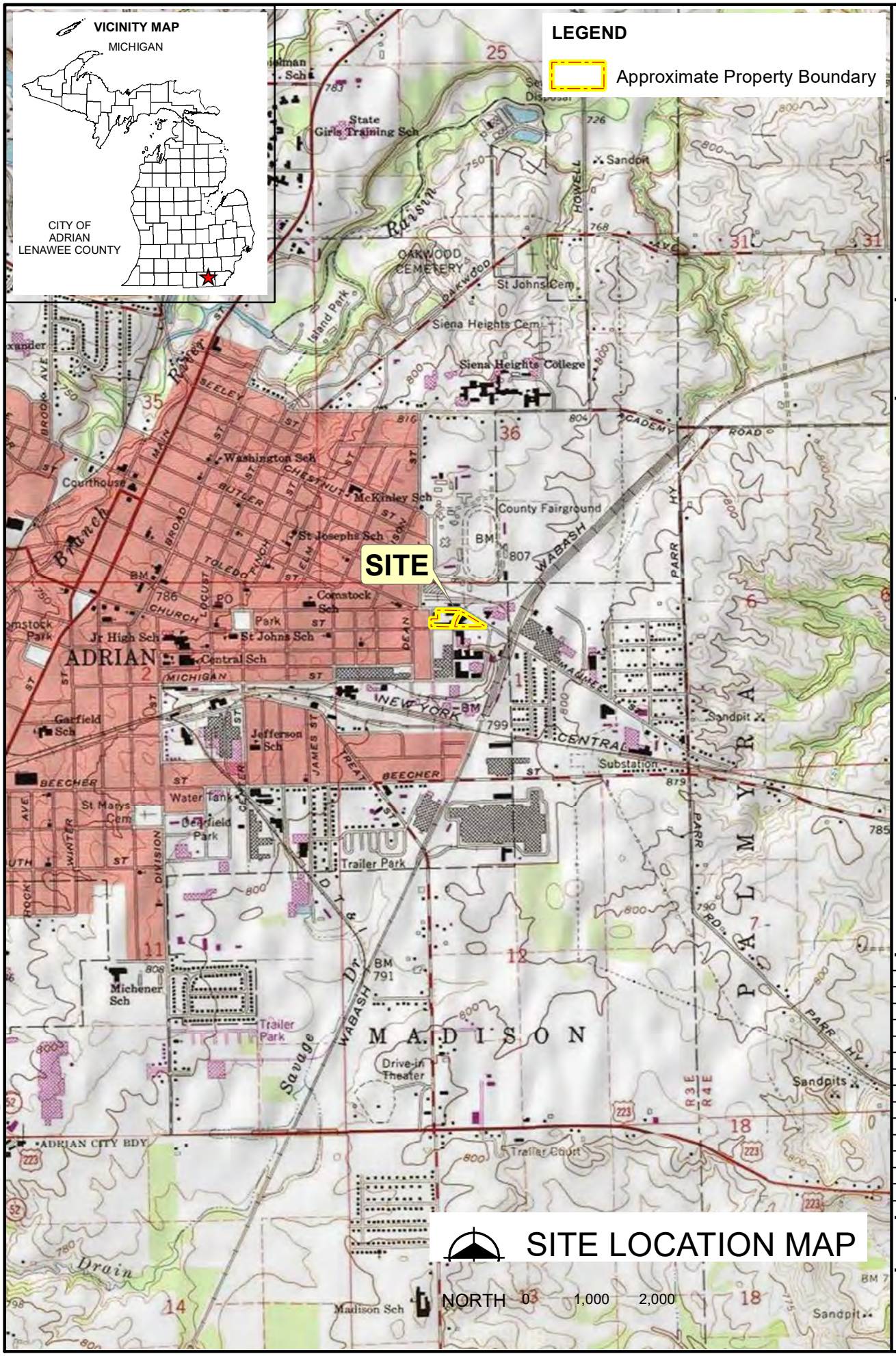
Maximum hourly emissions of each TAC were utilized in the Rule 227(1)(a) analysis detailed in Table 7, unless otherwise noted. As demonstrated in Table 7 proposed emission rate of each TAC is not greater than the AERs determined using the algorithms in Table 21 [of Rule 227]. Several compounds do not have screening levels assigned by EGLE. Crimson Holdings has not proposed increased emission rates of these compounds from those presented to EGLE when the odor neutralizer was first used. EGLE determined that the use of the odor neutralizer did not cause any adverse impacts for any TACs which may be emitted.

7.0 Summary and Conclusion

Crimson Holdings operates a powdered egg manufacturing facility in Adrian, Michigan. This facility has operated a spray dryer for agricultural products since the 1980s. Prior to Crimson Holdings beginning operation, the original stack was modified in such a way that it no longer complied with PTI 38-06. Crimson Holdings was asked to modify its PTI to include a Nuisance Odor Management Plan and to describe the new packed-bed scrubber. An air toxics analysis was prepared, which indicates that emissions from the powdered egg manufacturing process meet all the health-based standards referenced in Rules 225-230. Emissions from the proposed odor neutralizer system were also evaluated and found to be environmentally acceptable under Rules 225-230. No stack information was used in the TAC analysis and the final stack has not been selected. The existing stack is 38 inches in diameter with a

height of 100 feet above grade. The scrubber manufacturer has suggested a new stack that is 56 inches in diameter and 50 feet in height, though Crimson is working with an engineering firm to determine if it might be possible to retain the existing stack and route scrubber emissions to that.

Figures



SITE LOCATION MAP

fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

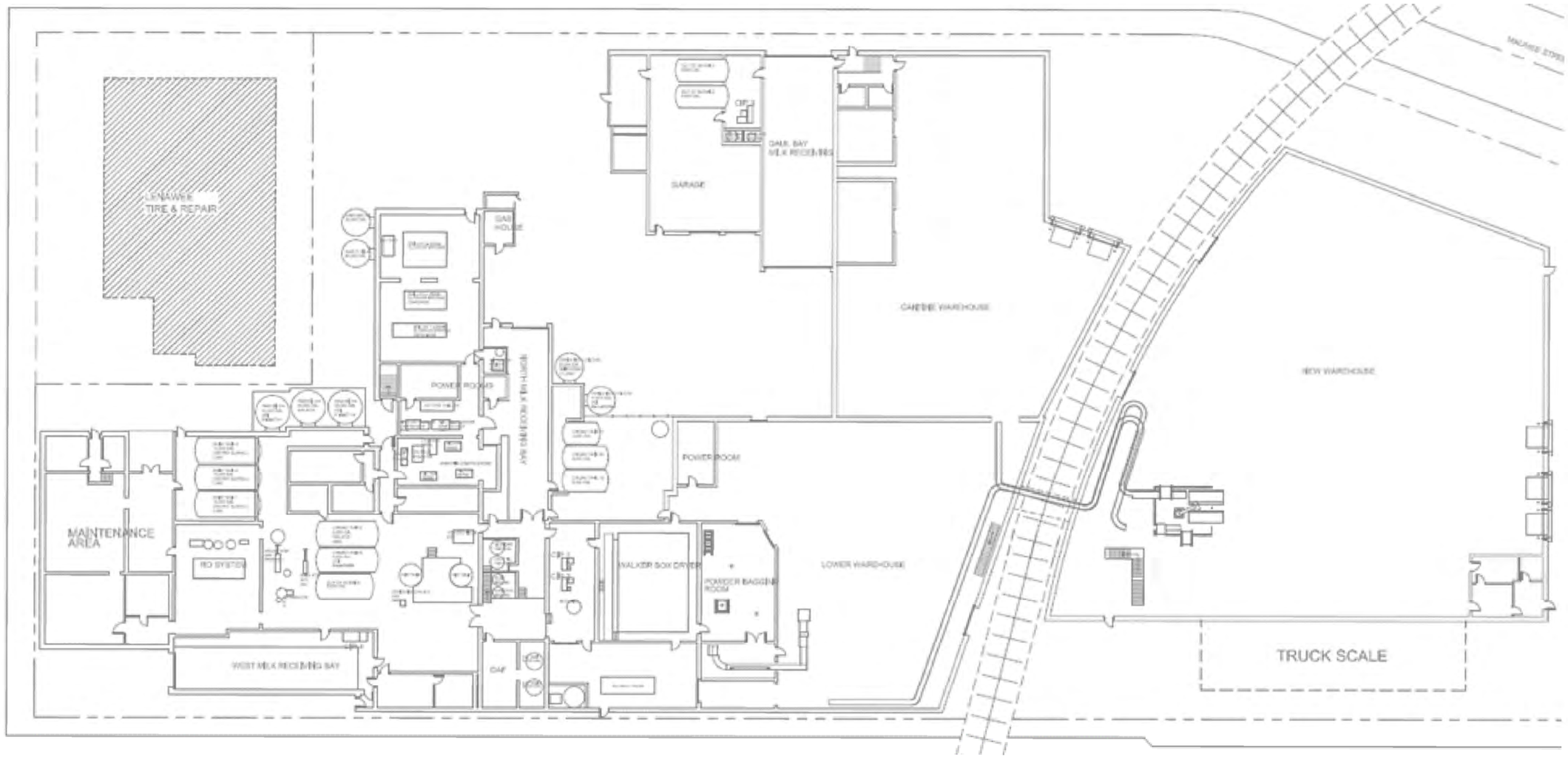
Crimson Holdings, LLC
1336 and 1406 East Maumee St., Adrian, Michigan

Permit to Install Application

PROJECT NO.
220602

FIGURE NO.
1

PLOT INFO: Z:\2021\211737\CAD\GIS\mapdoc\PIPPFIG01_SITE LOCATION MAP.mxd Date: 1/18/2022 2:05:12 PM User: acschwallier



NORTH

0 20 40 FEET

PLANT LAYOUT

DATA SOURCES:

PLOT INFO: Z:\2022\1211737\CADGIS\mapdoc\PIPPFIG02_Plant Layout.mxd Date: 9/22/2022 10:18:43 AM User: acschwaller

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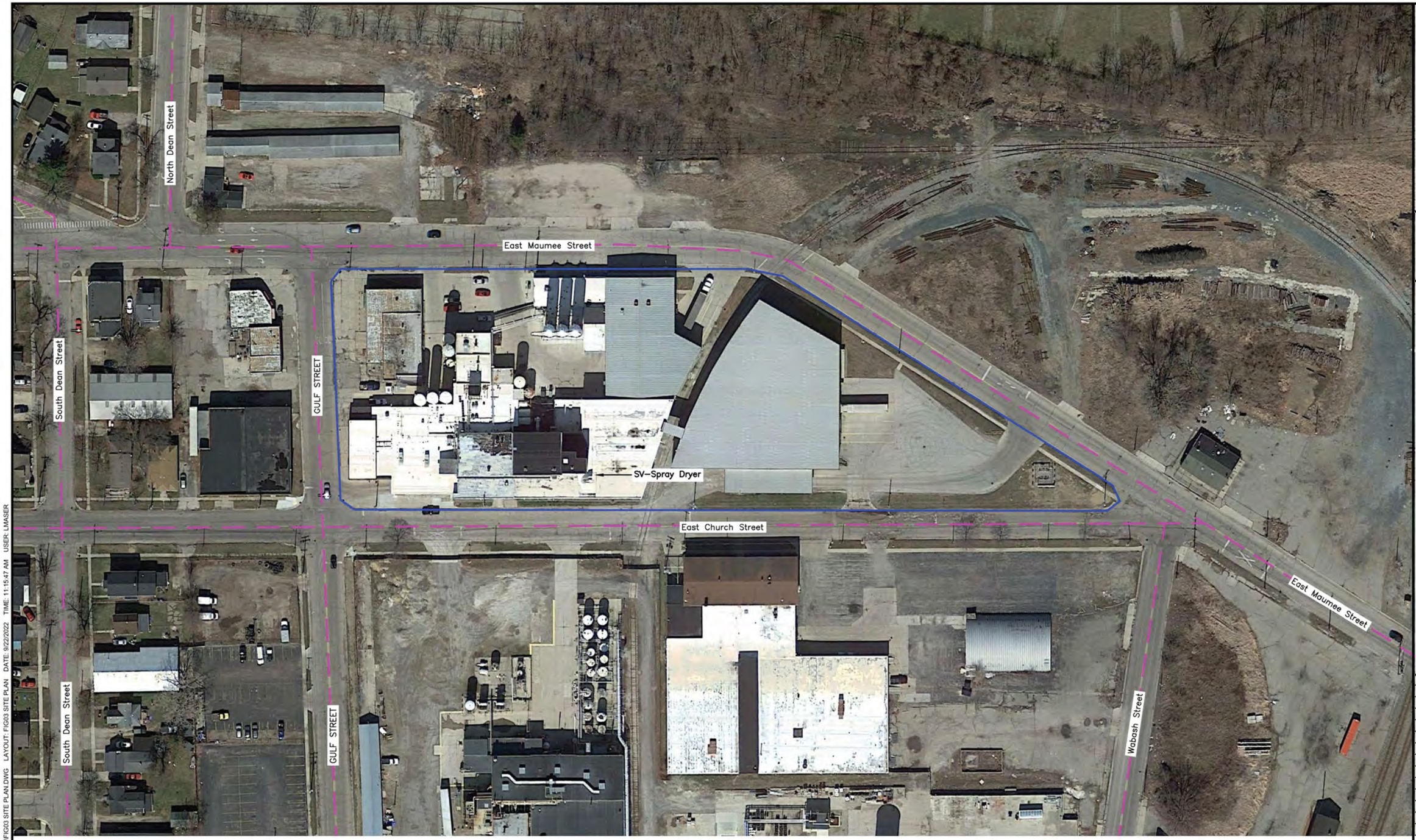
Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

Crimson Holdings, LLC
1336 and 1406 East Maumee St., Adrian, Michigan
Pollution Incident Prevention Plan

PROJECT NO.
220602

FIGURE NO.
2



LEGEND

ROAD

SITE BOUNDARY

NORTH

SITE PLAN

0 100 200

Scale: 1" = 100'

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Crimson Holdings, LLC

1336 East Maumee Street, Adrian, Michigan 49221

Permit to Install Application

PROJECT NO.
220602

FIGURE NO.
3

PLOT INFO: Z:\2022\220602\CAD\CD\FIG03 SITE PLAN.DWG LAYOUT: FIG03 SITE PLAN DATE: 9/22/2022 TIME: 11:15:47 AM USER: LMASER

Tables

Table 1 - Powdered Egg Manufacturing Emissions Summary (revised)

Crimson Holdings, LLC - Modification to PTI 38-06
Adrian, Michigan

Pollutant	Dryer				Conveyor System (tpy)	Facility Total (tpy)
	Process (tpy)	Odor Neutralizer (tpy)	Combustion (tpy)	Dryer Totals (tpy)		
CO			5.0	5.0		5.0
NO_X			6.0	6.0		6.0
PM	5.9		0.1	6.0	1.6	7.6
PM_{10}	7.7		0.5	8.1	1.6	9.7
$PM_{2.5}$	7.7		0.5	8.1	1.6	9.7
SO_2			0.04	0.04		0.0
VOC	7.7	0.4	0.3	8.4		8.4
CO_2			7,168	7,167.7		7,168
CH_4			0.1	0.1		0.1
N_2O			0.01	0.01		0.01
CO_2e			7,175	7,175.1		7,175
Lead			2.99E-05	2.99E-05		2.99E-05
Fluorides	No fluorides in natural gas.					
H_2SO_4	-		-	-		-

Table 2 - Powdered Egg Spray Dryer Emissions Summary (revised)

Crimson Holdings, LLC - Modification to PTI 38-06

Adrian, Michigan

Exhaust Flowrate	30,000	acfm
Annual Operating Hours	8760	hr/yr
Dryer Heat Input	14	MMBtu/hr (with combustion emissions)
Heating Value	1026	BTU/scf

NSR Regulated Pollutant	Dryer Emission Factor	Units	Maximum Hourly Emissions (lb/hr)	Annual Emissions (tpy)
Particulate matter (PM)	0.01	lb/1000 exhaust gas	1.4	5.9
Particulate matter (< 10 μm) (PM + condensables)	1.8	lb/hr	1.8	7.7
Particulate matter (< 2.5 μm) (PM + condensables)	1.8	lb/hr	1.8	7.7
Volatile organic compounds (VOCs) *	1.8	lb/hr	1.8	7.7

Highlighted emissions are proposed limits. Assumed that PM10 and PM2.5 emissions would be equal to PM emissions plus a 30% safety factor. PM, PM10 and PM2.5 from combustion of natural gas will be in addition to the emissions shown here and are calculated in Table 4.

* VOC Emissions were measured during stack testing at 0.88 lb/hr. A 100% safety factor was added.

Current process is permitted at 10.2 lb/hr.

Table 3 - Powdered Egg Spray Dryer TAC Emissions Summary

Crimson Holdings, LLC - Modification to PTI 38-06
Adrian, Michigan

Exhaust Flowrate	30,000	scfm
Annual Operating Hours	8,760	hr/yr

Toxic Air Contaminant	CAS Number	Uncontrolled Emission Factor (lb/hr)	Scrubber Control Efficiency (wt %)	Controlled Emission Factor (lb/hr)	Annual Emissions (tpy)
Ammonia	7664-41-7	1.32	90%	0.13	0.58
Carbonyl sulfide	463-58-1	0.28	70%	0.08	0.37

Stack testing was performed in June, 2022. Components above the detection limit, ammonia and carbonyl sulfide, were estimated using the test results multiplied by 2 (or with a 100% safety factor).

Table 4 - Powdered Egg Manufacturing Combustion Emissions Summary

Crimson Holdings, LLC - Modification to PTI 38-06

Adrian, Michigan

Exhaust Flowrate	30,000	acfm
Annual Operating Hours	8760	hr/yr
Dryer Heat Input	14	MMBtu/hr
Heating Value	1026	btu/scf

NSR Regulated Pollutant	Emission Factor (See Notes)		Annual Emissions (tpy)
CO[1]	84	lb/MMCF	5.0
NO_X[1]	100	lb/MMCF	6.0
PM[1]	1.9	lb/MMCF	0.1
PM_{10}[1]	7.6	lb/MMCF	0.5
$PM_{2.5}$[1]	7.6	lb/MMCF	0.5
SO_2[1]	0.6	lb/MMCF	0.0
VOC[1]	5.5	lb/MMCF	0.3
CO_2[2,3]	116.89	lb/MMBtu	7,168
CH_4[2,3]	2.2E-03	lb/MMBtu	0.1
N_2O[2,3]	2.2E-04	lb/MMBtu	0.0
CO_2e[2]	116.89	lb/MMBtu	7,175
Lead	5.0E-04	lb/MMCF	0.0

[1] Emission factors are from Web-fire for SCC 1-02-006-02 for a Boiler with a heat input capacity of 10-100 MMBtu/hr.

[2] CO_2e global warming potential and emission factors obtained from 40 CFR 98 Subparts A and C, respectively. The global warming potential for CH_4 (25) and N_2O (298) are consistent with the USEPA published changes on November 29, 2013.

[3] GHG emission factors are from the MDEQ "Greenhouse Gas Title V Permitting Guidance for Sources with Fuel Combustion Equipment"

Table 5 - TAC Emissions from Egg Dryer Combustion Equipment

Crimson Holdings, LLC - Modification to PTI 38-06

Adrian, Michigan

Heat Input Capacity (total)	MMBtu/hr	14.0
Heat Input Capacity	MMcf/hr	1.36E-02
Annual Operating Hours	hr/yr	8,760
Annual Heat Input Limit or Capacity	MMBtu/yr	122,640
Fuel Heat Value	MMBtu/MMcf	1,026

Toxic Air Contaminant	CAS No.	Emission Factor (See Notes)		Notes	Maximum Short-Term Emissions per Unit (lb/hr)	Annual Emissions (tpy)	HAP?
Formaldehyde	50-00-0	7.50E-02	lb/MMCF	1	1.02E-03	4.48E-03	Yes
Benzo (a) pyrene	50-32-8	1.20E-06	lb/MMCF	1	1.64E-08	7.17E-08	Yes
Dibenzo(a,h) anthracene	53-70-3	1.20E-06	lb/MMCF	1	1.64E-08	7.17E-08	Yes
3-Methylcholanthrene	56-49-5	1.80E-06	lb/MMCF	1	2.46E-08	1.08E-07	Yes
Benzo (a) anthracene	56-55-3	1.80E-06	lb/MMCF	1	2.46E-08	1.08E-07	Yes
Dimethylbenz(a)anthracene	57-97-6	1.60E-05	lb/MMCF	1	2.18E-07	9.56E-07	Yes
Benzene	71-43-2	2.10E-03	lb/MMCF	1	2.87E-05	1.26E-04	Yes
Acenaphthene	83-32-9	1.80E-06	lb/MMCF	1	2.46E-08	1.08E-07	Yes
Phenanthrene	85-01-8	1.70E-05	lb/MMCF	1	2.32E-07	1.02E-06	Yes
Fluorene	86-73-7	2.80E-06	lb/MMCF	1	3.82E-08	1.67E-07	Yes
Naphthalene	91-20-3	6.10E-04	lb/MMCF	1	8.32E-06	3.65E-05	Yes
2-Methyl Naphthalene	91-57-6	2.40E-05	lb/MMCF	1	3.27E-07	1.43E-06	Yes
Toluene	108-88-3	3.40E-03	lb/MMCF	1	4.64E-05	2.03E-04	Yes
N-Hexane	110-54-3	1.80E+00	lb/MMCF	1	2.46E-02	1.08E-01	Yes
Anthracene	120-12-7	2.40E-06	lb/MMCF	1	3.27E-08	1.43E-07	Yes
Pyrene	129-00-0	5.00E-06	lb/MMCF	1	6.82E-08	2.99E-07	Yes
Benzo (g,h,i) perylene	191-24-2	1.20E-06	lb/MMCF	1	1.64E-08	7.17E-08	Yes
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	lb/MMCF	1	2.46E-08	1.08E-07	Yes
Benzo (b) fluoranthene	205-99-2	1.80E-06	lb/MMCF	1	2.46E-08	1.08E-07	Yes
Fluoranthene	206-44-0	3.00E-06	lb/MMCF	1	4.09E-08	1.79E-07	Yes
Benzo (k) fluoranthene	207-08-9	1.80E-06	lb/MMCF	1	2.46E-08	1.08E-07	Yes
Acenaphthylene	208-96-8	1.80E-06	lb/MMCF	1	2.46E-08	1.08E-07	Yes
Chrysene	218-01-9	1.80E-06	lb/MMCF	1	2.46E-08	1.08E-07	Yes
Manganese	7439-96-5	3.80E-04	lb/MMCF	1	5.19E-06	2.27E-05	Yes
Mercury	7439-97-6	2.60E-04	lb/MMCF	1	3.55E-06	1.55E-05	Yes
Molybdenum	7439-98-7	1.10E-03	lb/MMCF	1	1.50E-05	6.57E-05	No
Nickel	7440-02-0	2.10E-03	lb/MMCF	1	2.87E-05	1.26E-04	Yes
Arsenic	7440-38-2	2.00E-04	lb/MMCF	1	2.73E-06	1.20E-05	Yes
Barium	7440-39-3	4.40E-03	lb/MMCF	1	6.00E-05	2.63E-04	No
Beryllium	7440-41-7	1.20E-05	lb/MMCF	1	1.64E-07	7.17E-07	Yes
Cadmium	7440-43-9	1.10E-03	lb/MMCF	1	1.50E-05	6.57E-05	Yes
Chromium	7440-47-3	1.40E-03	lb/MMCF	1	1.91E-05	8.37E-05	Yes
Cobalt	7440-48-4	8.40E-05	lb/MMCF	1	1.15E-06	5.02E-06	Yes
Copper	7440-50-8	8.50E-04	lb/MMCF	1	1.16E-05	5.08E-05	No
Vanadium	7440-62-2	2.30E-03	lb/MMCF	1	3.14E-05	1.37E-04	No
Zinc	7440-66-6	2.90E-02	lb/MMCF	1	3.96E-04	1.73E-03	No
Ammonia	7664-41-7	3.20E+00	lb/MMCF	1	4.37E-02	1.91E-01	No
Selenium	7782-49-2	2.40E-05	lb/MMCF	1	3.27E-07	1.43E-06	Yes
Dichlorobenzene, mixed isomers	25321-22-6	1.20E-03	lb/MMCF	1	1.64E-05	7.17E-05	No

[1] Emission factors are from Web-fire for SCC 1-02-006-02 because no TAC factors are available for SCC 1-02-006-03.

Emission Calculation Methods

Using lb/MMCF Emission Factors

$E_{ST} = C_{MMCF} \times EF_{MMCF}$

$E_{A} = E_{ST} \times$ Annual Operating Hours / 2,000 lb/ton

where:

E_{ST} = Short Term Emissions (lb/hr);

E_{A} = Annual Maximum Emissions (tpy);

C_{MMCF} = Max Fuel Usage (MMCF/hr); and

EF_{MMCF} = emission factor (lb/MMCF)

Table 6 - Odor Neutralizer Emission Estimates

Crimson Holdings, LLC - Modification to PTI 38-06

Adrian, Michigan

20367.00 lb/yr neutralizer

0.01851852 gallons per gallon solution at 53:1

8.37 lb/gal - density of solution

2.325 lb solution/hr (15 gph and 53:1 dilution)

4% organic content (assumed VOCs) in Concentrate 9118

814.68 lb/yr VOCs from 9118

Material ID	Toxic Air Contaminant	CAS No.	Concentration Range (%)	Annual Emissions (lb/yr)	Hourly Emissions (lb/hr)
9118	Abalyn	8050-15-5	< 0.01%	2.0367	2.3E-04
9118	Alcohol C-08	111-87-5	< 0.01%	2.0367	2.3E-04
9118	Aldehyde C-11 EN	112-45-8	< 0.01%	2.0367	2.3E-04
9118	Aldehyde C-11 UNDECYLIC	112-44-7	< 0.01%	2.0367	2.3E-04
9118	Amyl acetate	628-63-7	0.01 - 0.10%	20.367	2.3E-03
9118	Amyl butyrate	106-27-4	< 0.01%	2.0367	2.3E-04
9118	Amyl cinnamic aldehyde	122-40-7	< 0.01%	2.0367	2.3E-04
9118	Anethol	4180-23-8	< 0.01%	2.0367	2.3E-04
9118	Anisic aldehyde	123-11-5	< 0.01%	2.0367	2.3E-04
9118	Benzaldehyde	100-52-7	< 0.01%	0.0855414	9.8E-06
9118	Benzyl acetate	140-11-4	0.01 - 0.10%	20.367	2.3E-03
9118	Butyl cellusolve	111-76-2	0.5-1.00%	203.67	2.3E-02
9118	Carvacrol tech	6485-40-1	< 0.01%	2.0367	2.3E-04
9118	Cedarwood texas	68990-83-0	< 0.01%	2.0367	2.3E-04
9118	Cinnamic aldehyde	104-55-2	< 0.01%	2.0367	2.3E-04
9118	Citronella ceylon	8000-29-1	0.01-0.10%	20.367	2.3E-03
9118	Clove leaf oil	8015-97-2	< 0.01%	2.0367	2.3E-04
9118	Clove terpenes	68917-29-3	0.01-0.10%	20.367	2.3E-03
9118	Coumarin	91-64-5	< 0.01%	2.0367	2.3E-04
9118	Cyclamen aldehyde	103-95-7	< 0.01%	2.0367	2.3E-04
9118	Diethylphthalate	84-66-2	< 0.01%	2.0367	2.3E-04
9118	Limonene D	5989-27-5	0.1-0.5%	101.835	1.2E-02
9118	Dipentene PG	68956-56-9	0.01-0.10%	20.367	2.3E-03
9118	Diphenyl oxide	101-84-8	< 0.01%	2.0367	2.3E-04
9118	Ethyl acetate	141-78-6	0.01-0.10%	20.367	2.3E-03
9118	Ethyl butyrate	105-54-4	0.01-0.10%	20.367	2.3E-03
9118	Eucalyptus 80/85	8000-48-4	< 0.01%	2.0367	2.3E-04
9118	Eugenol	97-53-0	0.01-0.10%	20.367	2.3E-03
9118	Geraniol BJ	106-24-1	0.01-0.10%	20.367	2.3E-03
9118	Hercolyn D	8050-15-5	0.01-0.10%	20.367	2.3E-03
9118	Igepal CA630	9036-19-5	1.0-6.0%	814.68	9.3E-02
9118	ISO Bornyl acetate	125-12-2	0.01-0.10%	20.367	2.3E-03
9118	Lavender spike	8016-78-2	< 0.01%	2.0367	2.3E-04
9118	Lemongrass Oil	8007-02-1	0.01-0.10%	20.367	2.3E-03

Table 6 - Odor Neutralizer Emission Estimates

Crimson Holdings, LLC - Modification to PTI 38-06

Adrian, Michigan

20367.00 lb/yr neutralizer

0.01851852 gallons per gallon solution at 53:1

8.37 lb/gal - density of solution

2.325 lb solution/hr (15 gph and 53:1 dilution)

4% organic content (assumed VOCs) in Concentrate 9118

814.68 lb/yr VOCs from 9118

Material ID	Toxic Air Contaminant	CAS No.	Concentration Range (%)	Annual Emissions (lb/yr)	Hourly Emissions (lb/hr)
9118	Linalool Synthetic	78-70-6	< 0.01%	2.0367	2.3E-04
9118	Methyl anthranilate	134-20-3	0.01-0.10%	20.367	2.3E-03
9118	Methyl hexyl ketone	111-13-7	< 0.01%	2.0367	2.3E-04
9118	Methyl ionone gamma supreme	1335-46-2	< 0.01%	2.0367	2.3E-04
9118	Methyl salicylate	119-36-8	0.01-0.10%	20.367	2.3E-03
9118	Musk ketone	81-14-1	< 0.01%	2.0367	2.3E-04
9118	Orange oil valencia	8008-57-9	< 0.01%	2.0367	2.3E-04
9118	Phenyl acetic acid	103-82-2	< 0.01%	2.0367	2.3E-04
9118	Phenyl ethyl alcohol	60-12-8	< 0.01%	2.0367	2.3E-04
9118	Pimento leaf oil	8006-77-6	< 0.01%	2.0367	2.3E-04
9118	Rosemary spanish	8000-25-7	< 0.01%	2.0367	2.3E-04
9118	Styrallyl acetate	93-92-5	< 0.01%	2.0367	2.3E-04
9118	Terpineol 900	98-55-5	0.1-0.5%	101.835	1.2E-02
9118	Terpinyl acetate	80-26-2	0.1-0.5%	101.835	1.2E-02
9118	Unipine 85	8002-09-3	0.01-0.10%	20.367	2.3E-03
9118	Vanillin	121-33-5	0.01-0.10%	20.367	2.3E-03
9118	Vertofix	32388-55-9	< 0.01%	2.0367	2.3E-04
9118	Yara yara	93-04-9	< 0.01%	2.0367	2.3E-04
Pathosans	Hypochlorous acid	7790-92-3	0.03%	6.1101	7.0E-04
CupriDyne	Iodine	7553-56-2	0.03%	5.09175	5.8E-04
CupriDyne	Cuprous Iodide	7681-65-4	0.01%	2.0367	2.3E-04
CupriDyne	Sulfamic Acid	5329-14-6	<1	203.67	2.3E-02
CupriDyne	Potassium Bicarbonate	298-14-6	<1	203.67	2.3E-02

Table 7 - Predicted Ambient Impacts from TAC Summary using Rule 227(1)(a)

Crimson Holdings, LLC - Modification to PTI 38-06

Adrian, Michigan

Facility Name: Crimson Holdings **Facility Address:**

Chemical Name	CAS No.	Screening Level: 1st ITSL µg/m³	1st ITSL Avg Time	2nd ITSL µg/m³	2nd ITSL Avg Time	IRSL / SRSL µg/m³ (annual Avg)	AQD Footnote(s)	Allowable Emission Rate (AER): 1st ITSL Max lbs per hour	1st ITSL lbs per month, 24-hr, 8-hr or 1-hr	2nd ITSL Max lbs per hour	2nd ITSL lbs per month, 24-hr, 8-hr or 1-hr	IRSL / SRSL Max lbs per hour	IRSL / SRSL lbs per month	Proposed Emission Rate (ER): Max Hourly ER lbs/hour	Rate (1st ITSL)	1st ITSL Rate Units	Rate (2nd ITSL)	2nd ITSL Rate Units	Rate (IRSL)	IRSL / SRSL Rate Units	Is Proposed Emission Rate less than AER?: 1st ITSL Max Hourly Rate	1st ITSL ER	2nd ITSL Max Hourly Rate	2nd ITSL ER	IRSL Max Hourly Rate	IRSL ER
formaldehyde	50-00-0	30	24 hr			0.08		1.5	3.6			0.0432	3.2	1.02E-03	0.024561	lbs/24-hr			0.747076	lbs/month	yes	yes			yes	yes
benzo(a)pyrene	50-32-8	0.002	24 hr			0.001	5	0.0001	0.0002			0.0005	0.04	1.64E-08	3.93E-07	lbs/24-hr			1.2E-05	lbs/month	yes	yes			yes	yes
dibenz(a,h)anthracene	53-70-3						5							1.64E-08													
3-methylcholanthrene	56-49-5						5							2.46E-08													
benz(a)anthracene	56-55-3						5							2.46E-08													
7,12-dimethylbenz(a)anthracene	57-97-6						5							2.18E-07													
benzene	71-43-2	30	annual	30	24 hr	0.1		16.2	1200	1.5	3.6	0.054	4	2.87E-05	0.020918	lbs/month	0.000688	lbs/24-h	0.020918	lbs/month	yes	yes	yes	yes	yes	yes
acenaphthene	83-32-9	210	annual					113.4	8400					2.46E-08	1.79E-05	lbs/month					yes	yes				
phenanthrene	85-01-8	0.1	annual					0.054	4					2.32E-07	0.000169	lbs/month					yes	yes				
fluorene	86-73-7	140	annual					75.6	5600					3.82E-08	2.79E-05	lbs/month					yes	yes				
naphthalene	91-20-3	3	annual	520	8 hr	0.08		1.62	120	10.4	10.4	0.0432	3.2	8.32E-06	0.006076	lbs/month	6.66E-05	lbs/8-hr	0.006076	lbs/month	yes	yes	yes	yes	yes	yes
2-methylnaphthalene	91-57-6	10	annual					5.4	400					3.27E-07	0.000239	lbs/month					yes	yes				
toluene	108-88-3	5000	24 hr					250	600					4.64E-05	0.001113	lbs/24-hr					yes	yes				
n-hexane	110-54-3	700	annual					378	28000					2.46E-02	17.92982	lbs/month					yes	yes				
anthracene	120-12-7	1000	annual					540	40000					3.27E-08	2.39E-05	lbs/month					yes	yes				
pyrene	129-00-0	100	annual					54	4000					6.82E-08	4.98E-05	lbs/month					yes	yes				
benzo(g,h,i)perylene	191-24-2	13	annual					7.02	520					1.64E-08	1.2E-05	lbs/month					yes	yes				
Indeno(1,2,3-cd)pyrene	193-39-5						5							2.46E-08													
Benzo(b)fluoranthene	205-99-2						5							2.46E-08													
fluoranthene	206-44-0	140	annual					75.6	5600					4.09E-08	2.99E-05	lbs/month					yes	yes				
Benzo(k)fluoranthene	207-08-9						5							2.46E-08													
acenaphthylene	208-96-8	35	annual					18.9	1400					2.46E-08	1.79E-05	lbs/month					yes	yes				
chrysene	218-01-9						5							2.46E-08													
manganese and manganese compounds	7439-96-5	0.3	annual				29	0.162	12					5.19E-06	0.003785	lbs/month					yes	yes				
mercury and mercury compounds	7439-97-6	0.3	annual	1	24 hr		7	0.162	12	0.05	0.12			3.55E-06	0.00259	lbs/month	8.51E-05	lbs/24-h			yes	yes	yes	yes		
molybdenum	7439-98-7	30	8 hr					0.6	0.6					1.50E-05	0.00012	lbs/8-hr					yes	yes				
nickel	7440-02-0					0.006						0.0032	0.24	2.87E-05					0.020918	lbs/month					yes	yes
arsenic	7440-38-2					0.0002						0.0001	0.008	2.73E-06					0.001992	lbs/month					yes	yes
barium and soluble barium compounds	7440-39-3	5	8 hr				35	0.1	0.1					6.00E-05	0.00048	lbs/8-hr					yes	yes				
beryllium	7440-41-7	0.02	24 hr			0.0004		0.001	0.0024			0.0002	0.016	1.64E-07	3.93E-06	lbs/24-hr			0.00012	lbs/month	yes	yes			yes	yes
cadmium	7440-43-9					0.0006						0.0003	0.024	1.50E-05					0.010957	lbs/month					yes	yes
chromium	7440-47-3						17							1.91E-05													
cobalt and cobalt compounds that relea	7440-48-4	0.2	8 hr			0.00013	42	0.004	0.004			7E-05	0.0052	1.15E-06	9.17E-06	lbs/8-hr			0.000837	lbs/month	yes	yes			yes	yes
copper	7440-50-8	2	8 hr					0.04	0.04					1.16E-05	9.28E-05	lbs/8-hr					yes	yes				
See Instructions - Rule 227(1)(a) Tab	7440-62-2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.14E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	7440-66-6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.96E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
ammonia	7664-41-7	350	1 hr				39	0.35	0.35					1.76E-01	0.175665	lbs/hr					yes	yes				
selenium and inorganic selenium compo	7782-49-2	2	8 hr				34	0.04	0.04					3.27E-07	2.62E-06	lbs/8-hr					yes	yes				
See Instructions - Rule 227(1)(a) Tab	25321-22-6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.64E-05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	8050-15-5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.56E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	111-87-5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	112-45-8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	112-44-7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
n-amyl acetate	628-63-7	1100	annual					594	44000					2.33E-03	1.69725	lbs/month					yes	yes				
See Instructions - Rule 227(1)(a) Tab	106-27-4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	122-40-7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	4180-23-8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	123-11-5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
benzaldehyde	100-52-7					0.4						0.216	16	9.77E-06					0.007128	lbs/month					yes	yes
See Instructions - Rule 227(1)(a) Tab	140-11-4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2-butoxyethanol	111-76-2	1600	annual				10	864	64000					2.33E-02	16.9725	lbs/month					yes	yes				
See Instructions - Rule 227(1)(a) Tab	6485-40-1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	68990-83-0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	104-55-2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	8000-29-1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	8015-97-2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	68917-29-3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

% of AER — Turn values red if they are greater than: 100%

1st ITSL Max Hourly Rate	1st ITSL ER	2nd ITSL Max Hourly Rate	2nd ITSL ER	IRSL Max Hourly Rate	IRSL ER
0.1%	0.7%			2.4%	23.3%
0.0%	0.2%			0.0%	0.0%
0.0%	0.0%	0.0%	0.0%	0.1%	0.5%
0.0%	0.0%				
0.0%	0.0%				
0.0%	0.0%				
0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
0.0%	0.0%				
0.0%	0.0%				
0.0%	0.1%				
0.0%	0.0%				
0.0%	0.0%				
0.0%	0.0%				
0.0%	0.0%	0.0%	0.1%		
				0.9%	8.7%
				2.5%	24.9%
0.1%	0.5%				
0.0%	0.2%			0.1%	0.7%
				4.6%	45.7%
				1.6%	16.1%
0.0%	0.2%				
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
50.2%	50.2%				
0.0%	0.0%				
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
0.0%	0.0%				
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
0.0%	0.0%			0.0%	0.0%
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
0.0%	0.0%				
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Table 7 - Predicted Ambient Impacts from TAC Summary using Rule 227(1)(a)

Crimson Holdings, LLC - Modification to PTI 38-06

Adrian, Michigan

Facility Name: Crimson Holdings | Facility Address:

% of AER — Turn values red if they are greater than: 100%

Chemical Name	CAS No.	Screening Level: 1st ITSL µg/m³	1st ITSL Avg Time	2nd ITSL µg/m³	2nd ITSL Avg Time	IRSL / SRSL µg/m³ (annual Avg)	AQD Footnote(s)	Allowable Emission Rate (AER) 1st ITSL: Max lbs per hour	1st ITSL: lbs per month, 24-hr, 8-hr or 1-hr	2nd ITSL: Max lbs per hour	2nd ITSL: lbs per month, 24-hr, 8-hr or 1-hr	IRSL / SRSL: Max lbs per hour	IRSL / SRSL: lbs per month	Proposed Emission Rate (ER): Max Hourly ER lbs/hour	Rate (1st ITSL)	1st ITSL Rate Units	Rate (2nd ITSL)	2nd ITSL Rate Units	Rate (IRSL)	IRSL / SRSL Rate Units	Is Proposed Emission Rate less than AER?: 1st ITSL Max Hourly Rate	1st ITSL ER	2nd ITSL Max Hourly Rate	2nd ITSL ER	IRSL Max Hourly Rate	IRSL ER	% of AER: 1st ITSL Max Hourly Rate	1st ITSL ER	2nd ITSL Max Hourly Rate	2nd ITSL ER	IRSL Max Hourly Rate	IRSL ER
See Instructions - Rule 227(1)(a) Tab	91-64-5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	103-95-7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
diethyl phthalate	84-66-2	2800	annual					1512	112000					2.33E-04	0.169725	lbs/month					yes	yes					0.0%	0.0%				
d-limonene	5989-27-5	6250	annual					3375	250000					1.16E-02	8.48625	lbs/month					yes	yes					0.0%	0.0%				
hydrocarbons, terpene processing by-pr	68956-56-9	11	annual					5.94	440					2.33E-03	1.69725	lbs/month					yes	yes					0.0%	0.4%				
diphenyloxide	101-84-8	70	8 hr					1.4	1.4					2.33E-04	0.00186	lbs/8-hr					yes	yes					0.0%	0.1%				
ethyl acetate	141-78-6	3200	annual					1728	128000					2.33E-03	1.69725	lbs/month					yes	yes					0.0%	0.0%				
See Instructions - Rule 227(1)(a) Tab	105-54-4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	8000-48-4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	97-53-0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	106-24-1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
polyethylene glycol mono(octylphenyl)e	9036-19-5	1.9	annual					1.026	76					9.30E-02	67.89	lbs/month					yes	yes					9.1%	89.3%				
See Instructions - Rule 227(1)(a) Tab	125-12-2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	8016-78-2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	8007-02-1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	78-70-6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	134-20-3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2-octanone	111-13-7	6.9	annual					3.726	276					2.33E-04	0.169725	lbs/month					yes	yes					0.0%	0.1%				
See Instructions - Rule 227(1)(a) Tab	1335-46-2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	119-36-8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	81-14-1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	8008-57-9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	103-82-2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	60-12-8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	8006-77-6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	8000-25-7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	93-92-5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	98-55-5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.16E-02	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	80-26-2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.16E-02	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
yarmor pine oil	8002-09-3	10	annual					5.4	400					2.33E-03	1.69725	lbs/month					yes	yes					0.0%	0.4%				
See Instructions - Rule 227(1)(a) Tab	121-33-5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-03	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	32388-55-9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	93-04-9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
See Instructions - Rule 227(1)(a) Tab	7790-92-3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.98E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
iodine	7553-56-2	1	8 hr					0.02	0.02					5.81E-04	0.00465	lbs/8-hr					yes	yes					2.9%	23.3%				
See Instructions - Rule 227(1)(a) Tab	7681-65-4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.33E-04	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
sulfamic acid	5329-14-6	5	annual					2.7	200					2.33E-02	16.9725	lbs/month					yes	yes					0.9%	8.5%				
Potassium bicarbonate	298-14-6						26							2.33E-02																		
Polynuclear Aromatic Compounds with a Footnote of 5	50-32-8	0.002	24 hr			0.001	5	0.0001	0.0002			0.0005	0.04	3.98E-07	9.56E-06	lbs/24-hr			0.000291	lbs/month	yes	yes			yes	yes	0.4%	4.0%			0.1%	0.7%
Manganese Compounds with a Footnote of 29	7439-96-5	0.3	annual				29	0.162	12					5.19E-06	0.003785	lbs/month					yes	yes					0.0%	0.0%				
Barium Compounds with a Footnote of 35	7440-39-3	5	8 hr				35	0.1	0.1					6.00E-05	0.00048	lbs/8-hr					yes	yes					0.1%	0.5%				
Cobalt Compounds with a Footnote of 42	7440-48-4	0.2	8 hr			0.00013	42	0.004	0.004			7E-05	0.0052	1.15E-06	9.17E-06	lbs/8-hr			0.000837	lbs/month	yes	yes			yes	yes	0.0%	0.2%			1.6%	16.1%
Ammonia Compounds with a Footnote of 39	7664-41-7	350	1 hr				39	0.35	0.35					1.76E-01	0.175665	lbs/hr					yes	yes					50.2%	50.2%				
Selenium Compounds with a Footnote of 34	7782-49-2	2	8 hr				34	0.04	0.04					3.27E-07	2.62E-06	lbs/8-hr					yes	yes					0.0%	0.0%				
Glycol Ether Compounds with a Footnote of 10	111-76-2	1600	annual				10	864	64000					2.33E-02	16.9725	lbs/month					yes	yes					0.0%	0.0%				

Appendix 1

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

FEBRUARY 9, 2006

PERMIT TO INSTALL
NO. 38-06

ISSUED TO
DAIRY FARMERS OF AMERICA, INC.

LOCATED AT
1336 EAST MAUMEE STREET
ADRIAN, MICHIGAN 44333

IN THE COUNTY OF
LENAWEE

STATE REGISTRATION NUMBER
E8117

The Air Quality Division has approved this Permit to Install, pursuant to the delegation of authority from the Michigan Department of Environmental Quality. This permit is hereby issued in accordance with and subject to Section 5505(1) of Article II, Chapter I, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Pursuant to Air Pollution Control Rule 336.1201(1), this permit constitutes the permittee's authority to install the identified emission unit(s) in accordance with all administrative rules of the Department and the attached conditions. Operation of the emission unit(s) identified in this Permit to Install is allowed pursuant to Rule 336.1201(6).

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203: **2/9/2006**	
DATE PERMIT TO INSTALL APPROVED: **2/9/2006**	SIGNATURE:
DATE PERMIT VOIDED:	SIGNATURE:
DATE PERMIT REVOKED:	SIGNATURE:

PERMIT TO INSTALL

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Section **Page**

Common Abbreviations / Acronyms

Common Acronyms		Pollutant/Measurement Abbreviations	
AQD	Air Quality Division	Btu	British Thermal Unit
BACT	Best Available Control Technology	°C	Degrees Celsius
CAA	Clean Air Act	CO	Carbon Monoxide
CEM	Continuous Emission Monitoring	dscf	Dry standard cubic foot
CFR	Code of Federal Regulations	dscm	Dry standard cubic meter
COM	Continuous Opacity Monitoring	°F	Degrees Fahrenheit
EPA	Environmental Protection Agency	gr	Grains
EU	Emission Unit	Hg	Mercury
FG	Flexible Group	hr	Hour
GACS	Gallon of Applied Coating Solids	H_2S	Hydrogen Sulfide
GC	General Condition	hp	Horsepower
HAP	Hazardous Air Pollutant	lb	Pound
HVLP	High Volume Low Pressure *	m	Meter
ID	Identification	mg	Milligram
LAER	Lowest Achievable Emission Rate	mm	Millimeter
MACT	Maximum Achievable Control Technology	MM	Million
MAERS	Michigan Air Emissions Reporting System	MW	Megawatts
MAP	Malfunction Abatement Plan	ng	Nanogram
MDEQ	Michigan Department of Environmental Quality	NOx	Oxides of Nitrogen
MSDS	Material Safety Data Sheet	PM	Particulate Matter
NESHAP	National Emission Standard for Hazardous Air Pollutants	PM-10	Particulate Matter less than 10 microns diameter
NSPS	New Source Performance Standards	pph	Pounds per hour
NSR	New Source Review	ppm	Parts per million
PS	Performance Specification	ppmv	Parts per million by volume
PSD	Prevention of Significant Deterioration	ppmw	Parts per million by weight
PTE	Permanent Total Enclosure	psia	Pounds per square inch absolute
PTI	Permit to Install	psig	Pounds per square inch gauge
RACT	Reasonably Available Control Technology	scf	Standard cubic feet
ROP	Renewable Operating Permit	sec	Seconds
SC	Special Condition Number	SO_2	Sulfur Dioxide
SCR	Selective Catalytic Reduction	THC	Total Hydrocarbons
SRN	State Registration Number	tpy	Tons per year
TAC	Toxic Air Contaminant	µg	Microgram
TEQ	Toxicity Equivalence Quotient	VOC	Volatile Organic Compound
VE	Visible Emissions	yr	Year

* For High Volume Low Pressure (HVLP) applicators, the pressure measured at the HVLP gun air cap shall not exceed ten (10) pounds per square inch gauge (psig).

GENERAL CONDITIONS

1. The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. **[R336.1201(1)]**

2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environmental Quality, P.O. Box 30260, Lansing, Michigan 48909, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. **[R336.1201(4)]**

3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to R336.1210, operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. **[R336.1201(6)(b)]**

4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. **[R336.1201(8), Section 5510 of Act 451, PA 1994]**

5. The AQD District Supervisor shall be notified, in writing, of a change in ownership or operational control of the stationary source or emission unit(s) authorized by this Permit to Install pursuant to R336.1219. The notification shall include all of the information required by R336.1219(1)(a) and (b). In addition, a new owner or operator must submit a written statement pursuant to R336.1219(1)(c), agreeing to and accepting the terms and conditions of this Permit to Install, and shall notify the AQD District Supervisor of any change in the contact person for this Pemit to Install. **[R336.1219]**

6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. **[R336.1901]**

7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). **[R336.1912]**

8. Approval of this permit does not exempt the permittee from complying with any future applicable requirements which may be promulgated under Part 55 of 1994 PA 451, as amended or the Federal Clean Air Act.

9. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law nor does it affect any liability for past violations under the Natural Resources and Environmental Protection Act, 1994 PA 451.

10. Operation of this equipment may be subject to other requirements of Part 55 of 1994 PA 451, as amended and the rules promulgated thereunder.

11. Except as provided in subrules (2) and (3) or unless the special conditions of the Permit to Install include an alternate opacity limit established pursuant to subrule (4) of R336.1301, the permittee shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of density greater than the most stringent of the following. The grading of visible emissions shall be determined in accordance with R336.1303. **[R336.1301]**

    a) A six-minute average of 20 percent opacity, except for one six-minute average per hour of not more than 27 percent opacity.

    b) A visible emission limit specified by an applicable federal new source performance standard.

    c) A visible emission limit specified as a condition of this permit to install.

12. Collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in R336.1370(2). **[R336.1370]**

13. The Department may require the permittee to conduct acceptable performance tests, at the permittee's expense, in accordance with R336.2001 and R336.2003, under any of the conditions listed in R336.2001. **[R336.2001]**

SPECIAL CONDITIONS

Emission Unit Identification

Emission Unit ID	Emission Unit Description	Stack Identification
EU-Spray Dryer	Milk Spray Drying operation consisting of a drying chamber, a powder conveyor, a pneumatic conveyor, a fabric filter product collector, and a cyclonic product collector.	SV-Spray Dryer
Changes to the equipment described in this table are subject to the requirements of R336.1201, except as allowed by R336.1278 to R336.1290.		

The following conditions apply to: EU-Spray Dryer

Emission Limits

	Pollutant	Equipment	Limit	Time Period	Testing/ Monitoring Method	Applicable Requirements
1.1a	PM	EU-Spray Dryer	0.03 lbs per 1000 lbs of exhaust gases*	Test Protocol	General Condition No. 13	R336.1331
1.1b	PM-10	EU-Spray Dryer	10.2 Pounds Per Hour	Test Protocol	General Condition No. 13	40 CFR 52.21 Subparts (c) & (d)
	* Calculated on a dry gas basis.					

Visible Emission Limits

1.2 Visible emissions from EU-Spray Dryer shall not exceed a six-minute average of five percent opacity. **[R336.1301, R336.1331]**

Stack / Vent Restrictions

	Stack & Vent ID	Maximum Opening, Length x Width (inches)	Minimum Height Above Ground Level (feet)	Applicable Requirement
1.3	SV-Spray Dryer	55 X 53	25	R336.1901, 40 CFR 52.21(c) & (d)
	The exhaust gases shall be discharged unobstructed vertically upwards to the ambient air.			

Appendix 2

SPRAY DRIER PERFORMANCE FACTORS

Marriott Walker horizontal type driers are normally expected to operate at a design capacity of 63 pounds of powder per hour per foot of drier width, under the following conditions:

1. Concentrated feed supplied at 40% solids
2. Concentrated feed supplied at 140° F.
3. Supply air heated to 320° F.
4. Exhaust air discharged at 180° F.
5. Dried powder produced at 3% moisture

The foregoing conditions are standard for drier capacity comparison purposes. The performance factors explained in the column to the right and tabulated below may be used as multipliers (or divisors) to determine hourly powder capacities for driers running under other conditions. The same tables may be used with our tower driers.

SOLIDS FACTORS: Spray driers are actually water evaporators, hence the powder output will vary substantially with the percent of solids in the feed. Table 1 shows dried product (containing 3% moisture) multipliers that may be used to determine output of a drier at other than 40% solids feed, under constant evaporation conditions. Table 1 applies to powder output only, do not use it to modify evaporating capacity.

LIQUID TEMPERATURE FACTORS: The temperature of the concentrated feed to the drier directly influences drier evaporating capacity as shown by the multipliers in Table 2. This evaporation factor is also applicable to powder output.

AIR TEMPERATURE FACTORS: Hotter inlet air temperatures and cooler stack temperatures will increase the evaporating capacity of the spray drier, and the converse is also true. Actually, the difference between these temperatures measures the capacity of the drier as shown in Table 3. This evaporation factor is also applicable to powder output.

TABLE 1

Feed Solids	Capacity Multiplier	Feed Solids	Capacity Multiplier	Feed Solids	Capacity Multiplier	Feed Solids	Capacity Multiplier	Feed Solids	Capacity Multiplier
10%	.164	20%	.370	30%	.638	40%	1.000	50%	1.516
11	.182	21	.394	31	.669	41	1.043	51	1.580
12	.201	22	.418	32	.702	42	1.088	52	1.646
13	.220	23	.443	33	.735	43	1.135	53	1.716
14	.240	24	.468	34	.769	44	1.183	54	1.789
15%	.260	25%	.495	35%	.804	45%	1.233	55%	1.866
16	.281	26	.522	36	.841	46	1.285	56	1.946
17	.303	27	.549	37	.879	47	1.340	57	2.030
18	.325	28	.578	38	.918	48	1.396	58	2.119
19	.347	29	.608	39	.958	49	1.455	59	2.212

TABLE 2

Feed Temperature °F	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°	140°	150°	160°	170°	180°
Capacity Multiplier	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00	1.01	1.02	1.03	1.04

TABLE 3

Exhaust Temp.	Inlet Air Temperatures (°F) 300°	310°	320°	330°	340°	350°	360°	370°	380°	390°	400°
210°	Capacity		0.786	0.857	0.929	1.000	1.071	1.143	1.214	1.286	1.357
205°	Multipliers		0.821	0.893	0.964	1.036	1.107	1.179	1.250	1.321	1.393
200°	0.714	0.786	0.857	0.929	1.000	1.071	1.143	1.214	1.286	1.357	1.428
195°	0.750	0.821	0.893	0.964	1.036	1.107	1.179	1.250	1.321	1.393	1.464
190°	0.786	0.857	0.929	1.000	1.071	1.143	1.214	1.286	1.357	1.428	1.500
185°	0.821	0.893	0.964	1.036	1.107	1.179	1.250	1.321	1.393	1.464	1.536
180°	0.857	0.929	1.000	1.071	1.143	1.214	1.286	1.357	1.428	1.500	1.571
175°	0.893	0.964	1.036	1.107	1.179	1.250	1.321	1.393	1.464	1.536	1.607
170°	0.929	1.000	1.071	1.143	1.214	1.286	1.357	1.428	1.500	1.571	1.643
165°	0.964	1.036	1.107	1.179	1.250	1.321	1.393	1.464	1.536	1.607	1.678
160°	1.000	1.071	1.143	1.214	1.286	1.357	1.428	1.500	1.571	1.643	1.714
155°	1.036	1.107	1.179	1.250	1.321	1.393	1.464	1.536	1.607	1.678	1.750
150°	1.071	1.143	1.214	1.286	1.357	1.428	1.500	1.571	1.643	1.714	1.786
145°	1.107	1.179	1.250	1.321	1.393	1.464	1.536	1.607	1.678	1.750	
140°	1.143	1.214	1.286	1.357	1.428	1.500	1.571	1.643	1.714	Capacity	
135°	1.179	1.250	1.321	1.393	1.464	1.536	1.607	1.678	1.750	Multipliers	

OTHER PERFORMANCE FACTORS

In the winter, and in notably dry parts of the country, drier capacity will exceed these ratings due to low moisture (low absolute humidity) of the intake air.

Conversely, in the summertime and in notably humid parts of the country, drier capacity will be less than these ratings.

If final product contains more than 3% moisture, drier capacity will be increased, as not only will less moisture be removed, but lower exhaust temperatures will be allowable.

If final product must be dried to less than 3% moisture, drier capacity will be reduced not only because more water must be evaporated, but particularly because higher exhaust temperatures will be required.

While it is easier and more efficient to dry at high altitudes, due to low atmospheric pressure, the standard drier will actually suffer a reduction in capacity due to fan and air handling complications. Marriott Walker Corporation should be notified when the altitude at installation site exceeds 1500 feet, in order that the size and speeds of fans and motors may be adjusted to suit the circumstances.

Outdoor air intakes are recommended for spray driers. The large volumes of air used, if drawn from within the building, can have adverse effects upon space heating, cooling and sanitation, and in addition, inside air may be more humid and restricted in supply.

When gas fired, Walker driers are designed with only one heavy duty fan. This exhaust fan operates at the same temperature throughout the year, hence moving the same quantity of air. This eliminates the seasonal problems and complex remedies employed in attempting to compensate for variations in air density due to changes in supply air temperatures. When heat recovery systems are employed, an intake fan is usually necessary.

DRIER/EVAPORATOR CALCULATION

An evaporator and spray drier are to process 50,000 lbs./hr. of skim milk at 8.8% solids to powder at 3% moisture. Skim milk will be condensed to 45% solids in an evaporator, and fed to the drier at 150° F. The spray drier will operate with 350° F. inlet air and 185° F exhaust stack air.

Table 1 45% Solids Multiplier	1.233
Table 2 Liquid Feed Multiplier	1.01
Table 3 Air Temperatures Multiplier	1.179

63 lbs. powder per foot basic drier capacity multiplied by 1.233 x 1.01 x 1.179 = 92.5 lbs. powder per foot of drier width operating capacity under conditions specified.

50,000 lbs./hr. skim milk x .088 = 4,400 lbs. bone dry solids

4,400 lbs. dry solids ÷ .97 = 4,536 lbs. 3% moisture powder

4,536 lbs. powder ÷ 92.5 lbs./ft. = 49.0 ft. wide spray drier

Specify 50' wide spray drier, as Marriott Walker driers come in multiples of 5' of width.

4,400 lbs. dry solids ÷ .45 = 9,778 lbs. condensed skim milk

Evaporator Duty: 50,000 lbs./hr. 8.8% solids liquid feed
− 9,778 lbs. 45% concentrated product
40,222 lbs./hr. water evaporation

Spray Drier Duty: 9,778 lbs./hr. 45% solids feed
− 4,536 lbs. powder with 3% moisture
5,242 lbs./hr. water evaporation in drier

The foregoing shows the importance of the evaporator in the spray drying process. As an evaporator may have 10 to 20 times the thermal efficiency of a spray drier, the feed material should be concentrated under vacuum to the maximum practical degree before spray drying.

DRIER vs EVAPORATOR HEAT RECOVERY COMPUTATION

In the foregoing computation, the evaporator and spray drier capacities were determined. Approximate energy requirements for the evaporator portion of this work, in optional arrangements, are as follows:

Triple Effect Thermocompression Evaporator	$\frac{40222\#\text{ Evaporation}}{5\text{ (efficiency)}}$ = 8044#/Hr	Supply Steam
Quintuple Effect Thermocompression Evaporator	$\frac{40222\#\text{ Evaporation}}{8\text{ (efficiency)}}$ = 5028#/Hr	Supply Steam
Sextuple Effect Thermocompression Evaporator	$\frac{40222\#\text{ Evaporation}}{10\text{ (efficiency)}}$ = 4022#/Hr	Supply Steam

The spray drier, a less efficient evaporating device, requires more steam for heating than the amount of water removed from the product. For example, to evaporate 5242 pounds per hour of water in the 50' spray drier requires:

SPRING and FALL STEAM, heating 50° F. air to 350° F. ..... 13,562 #/Hr Steam

This is more steam than any of the evaporators require. A heat recovery device can save 25% of 13,562 pounds or 3,390 pounds of drier steam per hour.

More heat will be recovered in winter and less in summer. Similar savings are accomplished with direct gas fired driers. Accordingly, the energy saved by a drier heat recovery device far exceeds energy savings of an evaporator of more effects than four, if an investment choice were required.

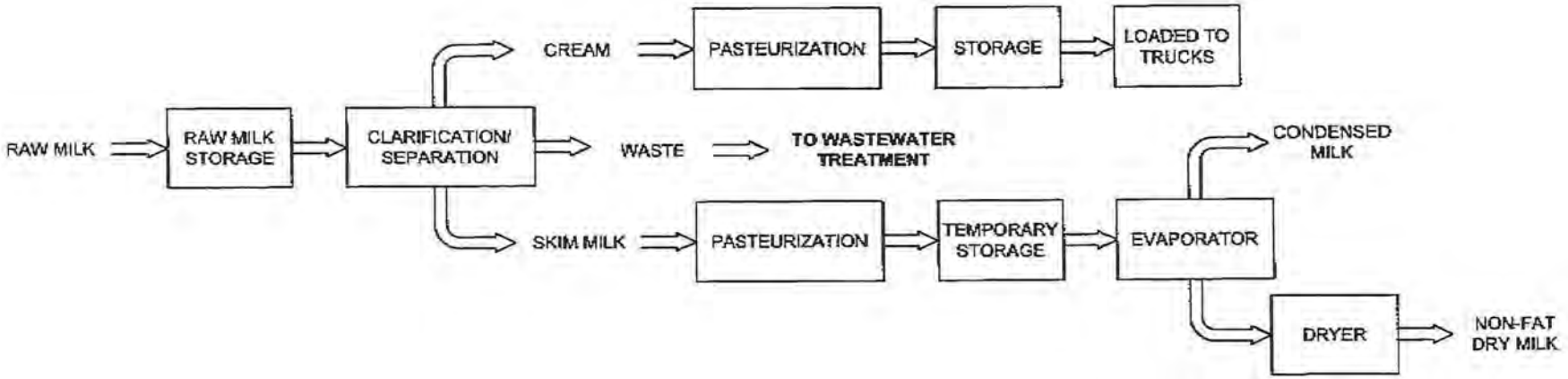

FIGURE 1
PROCESS FLOW DIAGRAM
DFA – MIDEAST AREA
ADRIAN MICHIGAN PLANT
FEBRUARY 2006

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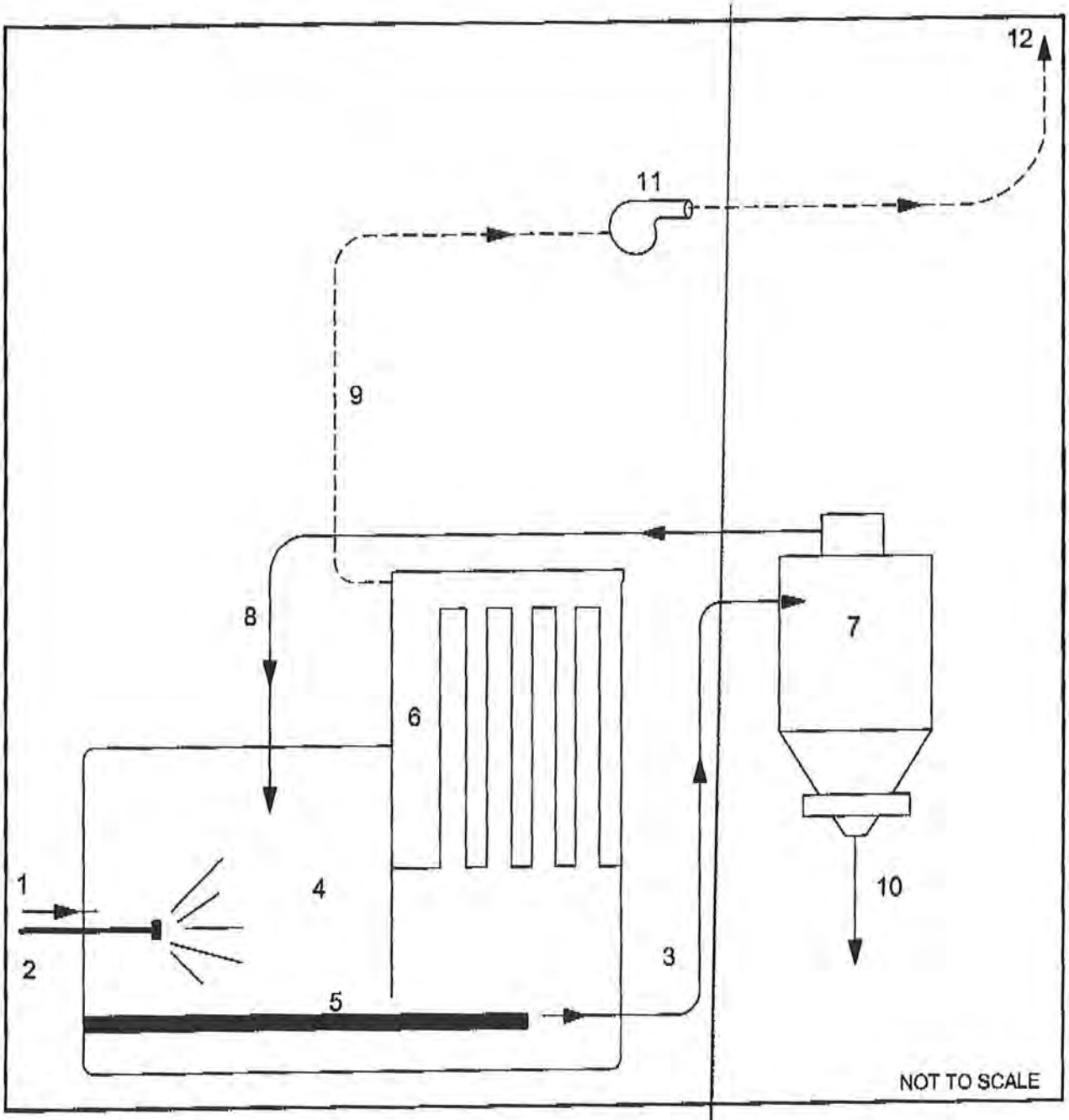


COMPONENTS

1. Drying air
2. Feedstock
3. Pneumatic conveyor
4. Drying chamber
5. Powder conveyor
6. Filter bags
7. Cyclone
8. Dust return
9. Exhaust to atmosphere
10. Dried powder
11. Exhaust blower
12. Stack

I:\cad\2005\25147-02\251472-04.dwg 2.8.2006

FIGURE 2
SPRAY DRYER PROCESS DIAGRAM
DFA – MIDEAST AREA
ADRIAN MICHIGAN PLANT
FEBRUARY 2006

MARRIOTT WALKER SPRAY DRIERS

Much of the success of Marriott Walker Corporation is due to the excellence of its horizontal spray drier, which features multiple high pressure product nozzles and an efficient bag type powder collector. The illustration to the right shows the uniformity of operation obtained by the multiple nozzle arrangement, giving complete drying in one step, with maximum water evaporation and minimum stack temperatures

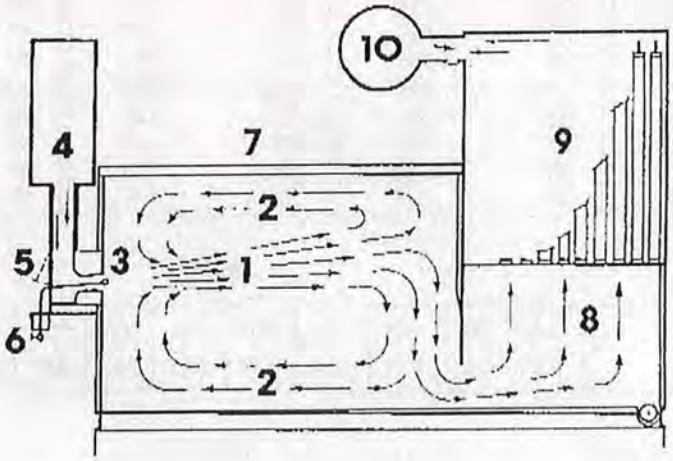
The cross section below shows the general arrangement and operating principles of the flat floor horizontal drier. This configuration permits easy, safe access for cleaning and inspection of the spray chamber and in addition, each bagroom compartment has a separate access door and aisle, and both inlet and exhaust systems have entrance doors for inspection and maintenance.

The Marriott Walker drier permits safe controlled drying, not only for dairy products, but for specialty formulated food stuffs, infant formula, whey protein, coffee whitener and egg products, including egg whites. The latter are particularly difficult to dry in ordinary driers and Marriott Walker type dust recovery is essential to retain this valuable product

The efficient bag type dust collector, returning the unsegregated fines directly to the drier floor, is essential for full product recovery and maximum returns. In addition, the baghouse dust collector removes environmental problems associated with cruder dust collection systems. No Marriott Walker drier has been cited for atmospheric pollution and many of them are located in large cities.

CROSS SECTION THROUGH MARRIOTT WALKER SPRAY DRIER

1. Active drying zone suspended horizontally in the center of the drier from left to right wall.
2. Forced recirculation of air and drying particles along the floor and ceiling of the drier.
3. Product spray nozzles arrayed horizontally, the number varying with the width and capacity of the spray chamber. The heated air is admitted through a long horizontal slot congruent with the spray nozzles.
4. Stainless steel plenum delivers high temperature inlet air to the spray heads.
5. Spray heads where heated air is turned to enter the drier with spray nozzles (3). Access doors facilitate inspection and cleaning.
6. Stainless wash troughs, integral with the spray heads, support the spray pipes, with a separate valve for each spray nozzle.
7. The drying chamber is a rectangular space with insulated stainless steel lined walls.
8. The powder laden air leaves the spray chamber along the back wall and enters into a settling chamber below the dust collector.
9. The dust collector contains vertical bags suspended from an automatic shaking mechanism which is programmed to shake periodically, at which time the individual cell is isolated from the air system by a damper arrangement



10. The exhaust air manifold collects clean spent air from the individual cells of the dust collector, and discharges it to atmosphere by means of an exhaust fan and stack.

In the Marriott Walker Horizontal Type Spray Drier, the dried product falls to the floor of spray chamber and also to the floor of the settling chamber when dropped from the bags by the automatic shakers. A sweep conveys the dried product to one wall of the drier, at which point it is discharged into an auger conveyor which discharges the powder through the drier outlet airlock valve into a separate cooler/conveyor system

SPRAY DRIER PERFORMANCE FACTORS

Marriott Walker horizontal type driers are normally expected to operate at a design capacity of 63 pounds of powder per hour per foot of drier width, under the following conditions:

1. Concentrated feed supplied at 40% solids
2. Concentrated feed supplied at 140° F.
3. Supply air heated to 320° F.
4. Exhaust air discharged at 180° F.
5. Dried powder produced at 3% moisture

The foregoing conditions are standard for drier capacity comparison purposes. The performance factors explained in the column to the right and tabulated below may be used as multipliers (or divisors) to determine hourly powder capacities for driers running under other conditions. The same tables may be used with our tower driers.

SOLIDS FACTORS: Spray driers are actually water evaporators, hence the powder output will vary substantially with the percent of solids in the feed. Table 1 shows dried product (containing 3% moisture) multipliers that may be used to determine output of a drier at other than 40% solids feed, under constant evaporation conditions. Table 1 applies to powder output only, do not use it to modify evaporating capacity.

LIQUID TEMPERATURE FACTORS: The temperature of the concentrated feed to the drier directly influences drier evaporating capacity as shown by the multipliers in Table 2. This evaporation factor is also applicable to powder output.

AIR TEMPERATURE FACTORS: Hotter inlet air temperatures and cooler stack temperatures will increase the evaporating capacity of the spray drier, and the converse is also true. Actually, the difference between these temperatures measures the capacity of the drier as shown in Table 3. This evaporation factor is also applicable to powder output.

TABLE 1

Feed Solids	Capacity Multiplier	Feed Solids	Capacity Multiplier	Feed Solids	Capacity Multiplier	Feed Solids	Capacity Multiplier	Feed Solids	Capacity Multiplier
10%	.164	20%	.370	30%	.638	40%	1.000	50%	1.516
11	.182	21	.394	31	.669	41	1.043	51	1.580
12	.201	22	.418	32	.702	42	1.088	52	1.646
13	.220	23	.443	33	.735	43	1.135	53	1.716
14	.240	24	.468	34	.769	44	1.183	54	1.789
15%	.260	25%	.495	35%	.804	45%	1.233	55%	1.866
16	.281	26	.522	36	.841	46	1.285	56	1.946
17	.303	27	.549	37	.879	47	1.340	57	2.030
18	.325	28	.578	38	.918	48	1.396	58	2.119
19	.347	29	.608	39	.958	49	1.455	59	2.212

TABLE 2

Feed Temperature °F	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°	140°	150°	160°	170°	180°
Capacity Multiplier	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00	1.01	1.02	1.03	1.04

TABLE 3

Exhaust Temp.	Inlet Air Temperatures (°F) 300°	310°	320°	330°	340°	350°	360°	370°	380°	390°	400°
210°	Capacity		0.786	0.857	0.929	1.000	1.071	1.143	1.214	1.286	1.357
205°	Multipliers		0.821	0.893	0.964	1.036	1.107	1.179	1.250	1.321	1.393
200°	0.714	0.786	0.857	0.929	1.000	1.071	1.143	1.214	1.286	1.357	1.428
195°	0.750	0.821	0.893	0.964	1.036	1.107	1.179	1.250	1.321	1.393	1.464
190°	0.786	0.857	0.929	1.000	1.071	1.143	1.214	1.286	1.357	1.428	1.500
185°	0.821	0.893	0.964	1.036	1.107	1.179	1.250	1.321	1.393	1.464	1.536
180°	0.857	0.929	1.000	1.071	1.143	1.214	1.286	1.357	1.428	1.500	1.571
175°	0.893	0.964	1.036	1.107	1.179	1.250	1.321	1.393	1.464	1.536	1.607
170°	0.929	1.000	1.071	1.143	1.214	1.286	1.357	1.428	1.500	1.571	1.643
165°	0.964	1.036	1.107	1.179	1.250	1.321	1.393	1.464	1.536	1.607	1.678
160°	1.000	1.071	1.143	1.214	1.286	1.357	1.428	1.500	1.571	1.643	1.714
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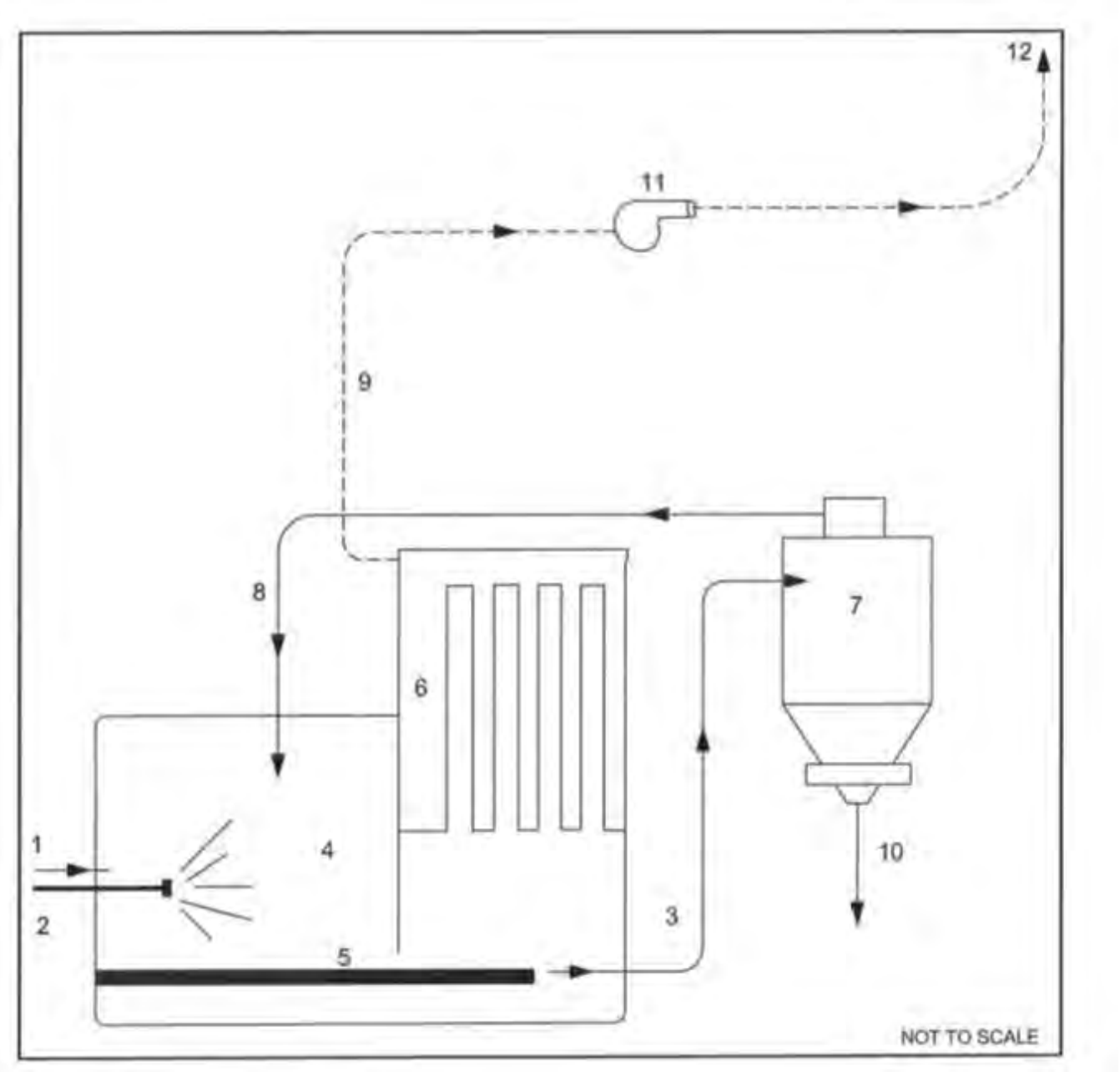
145°	1.107	1.179	1.250	1.321	1.393	1.464	1.536	1.607	1.678	1.750	
140°	1.143	1.214	1.286	1.357	1.428	1.500	1.571	1.643	1.714	Capacity	
135°	1.179	1.250	1.321	1.393	1.464	1.536	1.607	1.678	1.750	Multipliers	

Appendix 3

Appendix 4 – Fabric Filter Dust Collector Diagram

This is a diagram that better represents the relationship between the drier, cyclone and baghouse dust collector.



As we indicated earlier, the baghouse dust collector was manufactured by the same company that manufactured the drier. They were purchased together. The baghouse has 552 bags that are 6" in diameter and 120" long for a total area of 8671 ft^2. With air flow of 28,000 cfm the A/C ratio is 3.2. It has an automatic reverse pulse jet cleaning system that returns collected material to the drier. Clean air exhausts through the inside of the bags. Information on the bags is also included. The bags can be described as follows:

Filter Holdings style# s/124-22 Filter Media

16oz Polyester w. Teflon Finish

Fiber Content	**:**	**100% polyester**
Construction	**:**	**Needle-punched felt**
Surface Finish	**:**	**Teflon**
Nominal Weight	**:**	**16 oz. per square yard**
Air Permeability @ 0.5 inch water gauge	**:**	**25-35 CFM per square foot**
Operating Temperature	**:**	**275°F continuous**
Nominal Efficiency	**:**	**99% for particles for particles 1 micron and above**

The entire system is generally brought down once per week for maintenance and cleaning. Prior to start-up, the air pressure to the baghouse dust collector is verified and set to the proper air pressure for cleaning during production. The sonic horns air pressure is also set and verified. After start-up, the following operating parameters are monitoring and checked once per hour during production:

- Air inlet and exhaust temperature
- Baghouse dust collector pressure drop
- Dust probe detector

When the system is brought down at the end of its production run, the following items are inspected (repaired or replaced as needed) once per week:

- Baghouse dust collector reverse pulse system valves
- Baghouse dust collector air filter

The inside of dust collector and conveying system is inspected for excessive dust which would indicate a broken bag or other problem. Any brokens are replaced at that time as well as during periodic maintenance. The system is also cleaned at that time.

The facility has also routine preventive maintenance scheduled on a periodic basis. We plan to include additional information in the Nuisance Management or Odor Management Plan we are developing.

FILTER HOLDINGS
Specialists in High Performance Filters

Technical Specifications

Filter Holdings style# s/124-22 Filter Media

16oz Polyester w. Teflon Finish

Fiber Content	**:**	**100% polyester**
Construction	**:**	**Needle-punched felt**
Surface Finish	**:**	**Teflon**
Nominal Weight	**:**	**16 oz. per square yard**
Air Permeability @ 0.5 inch water gauge	**:**	**25-35 CFM per square foot**
Operating Temperature	**:**	**275°F continuous**
Nominal Efficiency	**:**	**99% for particles for particles 1 micron and above**

WAREHOUSE DUST COLLECTOR

Originally purchased in 1984

Performance: 10hp exhauster. This was replaced in 2008. Based on the inlet size of 10” it is sized for 2250-2500 CFM at 7” external static pressure.

Bag efficiency: Using Beane Bag polyester knit, at 7” is 98.88%.

Depending on the filter type, the efficiency can change.

The manufacturer can recommend an alternate filter material based on product and sample.

14

FILTER EFFICIENCY

May 19, 1997

NET EFFICIENCY (%)

Test Method: Aerosol Retention Efficiency per IBR TM E-217
Flow Rate: 3/1 (CFM/Sq.Ft.)
Temperature: Ambient
Contaminant: PTI Coarse Test Dust
Note: Filter media in the as loaded, stabilized condition, prior to shaking.

Fabric Filter Media	Particle Size (Microns)						
	0.5 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 7	>7
10 0z Cotton Sateen	99.94	99.97	99.93	99.87	>99.96	99.73	98.39
10 oz Napped Cotton Sateen	99.30	99.75	99.89	99.96	99.87	99.10	>99.78
10 oz Napped Cotton Sateen*	>99.99	>99.99	>99.99	>99.99	>99.95	>99.94	>99.72
Beane Bag Polyester Knit	80.79	87.10	91.63	94.97	94.64	96.83	98.88
13.5 oz Napped Polypropylene Sateen*	99.93	99.99	100	100	100	100	100

* Filter media preloaded with Cab-O-Sil preload powder

Clear Edge Filtration
11607 E 43rd Street North
Tulsa, Oklahoma 74116
United States of America
Tel +1 918-984-6000

Technical Data Sheet

Product Code PESN1630GL-FDA

Fibre Polymer
Polyester

Scrim
Self-Supported

Weight*
545 - g/m²
16.0 - oz/yd²

Thickness*
1.65 mm
0.07 - inch

Air Permeability*
144 - l/dm²/min @ 200Pa
30.0 - cfm/ft² @ 0.5" wg

Finish
Heatset / Glazed

Mullen Burst
400 - PSI

Test Data - Machine Direction (MD)
Tensile Strength (Min) - 34 kgf 75 lbf
Thermal Shrinkage^ - 3.0% %

Test Data - Cross Machine Direction (CMD)
Tensile Strength (Min) - 45 kgf 100 lbf
Thermal Shrinkage^ - 3.0% %

FDA Compliance
YES

Resistivity
Not Tested

* Weight, Thickness and Air Permeability are nominal values
^ Test Method 2 Hours @ 150°C 2 Hours @ 300°F

Additional Guidance on Fiber

- Very Good Resistance to Wear
- Fair Resistance to Alkalis
- Poor Resistance to Hydrolysis
- Good Resistance to Oxidising Agents
- Good Resistance to Strong Acids
- Continuous Dry Heat Operation 135°C (275°F)

Document Title/Version: TDS_PESN1630GL-FDA_v01 Version Date: December 10, 2019

Appendix 4

Tri-Mer® CORPORATION
Technology Leader air pollution control

Corporate Office
1400 E Monroe St
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Owosso, MI 48867
Main (989) 723-7838
Fax (989) 723-7844

Kirk Kelley
Sales Engineer, Wet Scrubber Technologies
Mobile (989) 627-4660
kkelley@tri-mer.com

P-23.807 R2
April 13, 2023
salesdpt@tri-mer.com
www.tri-mer.com

Technical Specification and Pricing
2-Stage V/F-108-120 Odor Control Scrubber

Prepared for:

Crimson Holdings
1336 E Maumee St.
Adrian, MI 49221

Attention: Daniel Hofbauer
Phone: 517-662-0639
Email: dhofbauer@crimsonhldg.com

I. Project Notes (PLEASE READ)

The odors that have been reported and which form the basis for a notice of violation are described variously as foul and offensive, like amines from biological breakdown of proteins, and sour – perhaps due to lactic acid from bacterial action on egg.

Stack testing by Chase Young Environmental Testing was done on 21 June 2022. They found 0.68 lb/hr ammonia, 0.159 lb/hr carbonyl sulfide (COS) and sulfur dioxide (SO2), and 0.92 lb/hr VOC (reported as methane). No amines were detected, although that portion of the testing was incomplete. No other reduced-sulfur compounds were detected.

We are inclined to believe the VOCs, which are not identified according to species, are probably organic acids, although they could also be some of the foul-smelling nitrogenous compounds associated with odor described as putrid. Therefore, we propose a two-stage system. The first stage will remove ammonia, amines, an all-other nitrogenous compound by absorption into an acidic solution. The second stage will remove COS, SO2, and organic acids in a solution of caustic-hypochlorite. The hypochlorite may not be necessary but is included as a way of sweetening the exhaust.

II. Operating Conditions and Design Parameters

A. Process description ..... Odor from Spray Dryer in Production of Powdered Eggs
B. Process outlet flow, acfm at 165°F 30,000
C. Process contaminant loads or concentrations at inlet:
   1. Ammonia ..... 0.68 lb/hr
   2. Carbonyl Sulfide (COS) & Sulfur Dioxide (SO2) ..... 0.159 lb/hr
   3. VOC (reported as methane) ..... 0.92 lb/hr
D. External static pressure ..... not specified, estimated -2.0 "wg
E. Tri-Mer system internal static pressure, "wg ..... -7.7 “wg
F. Total estimated process pressure, "wg ..... -9.7 “wg
G. Environmental conditions:
   1. Geographic location ..... Adrian, MI
   2. Elevation, feet above sea level ..... ≈ 787
   3. Equipment location (i.e., indoors or outdoors) ..... Outdoors

III. System Component Specifications (Scope of Supply) (Two Stage Scrubber)

A. Vertical/Flow (V/F) Packed Bed Tower Scrubber: Model V/F-108-120 **(stage one)**

Wet packed bed scrubber in vertical configuration (countercurrent) to be constructed of UV-inhibited white polypropylene. Random dump packing to be Tri-Packs® type in polypropylene material of construction. Mist eliminator to be mesh pad type in polypropylene material of construction. Integral recirculation system to consist of horizontal, magnetic drive pump(s), schedule 80 PVC plumbing and internal sump.

1. Scrubber material of construction ..... UV-inhibited white polypropylene
2. Packing type ..... Tri-Packs®
3. Packing material of construction ..... polypropylene
4. Scrubber Diameter ..... 108”
5. Packed Bed Depth ..... 120”
6. Packing Quantity ..... 640 Cubic Foot

<u>replacement packing can be purchased at $30 per cubic foot</u>

7. Mist eliminator type ..... chevron blade, 99.0% efficiency at ≥ 20 µm
8. Mist eliminator material of construction ..... polypropylene
9. Recirculation pump delivery ..... 510 GPM
10. Recirculation pump type ..... centrifugal, horizontal, magnetic drive
11. 100% Redundant Recirculation Pumps ..... Included
12. Plumbing ..... schedule 80 PVC
13. Recirculation sump ..... integral/internal to scrubber
14. Hardware ..... 316 Stainless Steel or Plated
15. Gaskets ..... PVC Foam Type, EPDM or Viton on all pipe flanges, valves, and unions
16. Wind & Seismic Calculations ..... Included

B. Vertical/Flow (V/F) Packed Bed Tower Scrubber: Model V/F-108-120 **(stage two)**

Wet packed bed scrubber in vertical configuration (countercurrent) to be constructed of UV-inhibited white polypropylene. Random dump packing to be Tri-Packs® type in polypropylene material of construction. Mist eliminator to be mesh pad type in polypropylene material of construction. Integral recirculation system to consist of horizontal, magnetic drive pump(s), schedule 80 PVC plumbing and internal sump.

1. Scrubber material of construction ..... UV-inhibited white polypropylene
2. Packing type..... Tri-Packs®
3. Packing material of construction .....polypropylene
4. Scrubber Diameter .....108”
5. Packed Bed Depth .....120”
6. Packing Quantity .....640 Cubic Foot

replacement packing can be purchased at $30 per cubic foot

7. Mist eliminator type .....chevron blade, 99.0% efficiency at ≥ 20 µm
8. Mist eliminator material of construction.....polypropylene
9. Recirculation pump delivery.....510 GPM
10. Recirculation pump type ..... centrifugal, horizontal, magnetic drive
11. 100% Redundant Recirculation Pumps .....Included
12. Plumbing ..... schedule 80 PVC
13. Recirculation sump.....integral/internal to scrubber or external/remote
14. Hardware.....316 Stainless Steel or Plated
15. Gaskets ..... PVC Foam Type, EPDM or Viton on all pipe flanges, valves, and unions
16. Wind & Seismic Calculations .....Included

C. Exhaust Fan Assembly

1. Model / type..... 36-PLR-IV
2. Operational performance .....29,027 acfm, -9.7 "wg, 1,590 rpm, 57.6 bhp, 0.0652 lb/ft^3, 800 ft asl, 70°F
3. Housing material of construction..... 316 Stainless Steel
4. Impeller type.....Backward Inclined
5. Impeller material of construction ..... 316 Stainless Steel
6. Motor ..... 75 HP TEFC premium efficient
7. Arrangement 1
8. Inlet .....flanged with flexible connector
9. Outlet.....flanged with flexible connector
10. Base isolation..... spring type
11. Frame and pedestal material of construction..... carbon steel
12. Drive, shaft, and bearing guards material of construction ..... carbon steel
13. Drain.....included
14. Inspection door.....included

D. Electrical Controls and Instrumentation **(one panel to operate both stages)**

Tri-Mer Corporation designs and builds all electrical devices and control devices per the National Electric Code (NEC). Other local codes or company electrical codes are not included in this proposal.

1. Enclosure Type ..... NEMA 4X
2. Control Type..... PLC
3. Recirculation Pump Control .....AB Line Starter
4. Exhaust Fan Control .....AB Line Starter
5. Differential Pressure Monitoring. Dwyer Series 605 (Mechanical Gauge with Transmitter). Quantity of two (2) required for independent monitoring of packing bed and mist eliminator.
6. Liquid Flow Monitoring .....GF Signet 515 (Paddlewheel) + GF Signet 9900 (Digital Display with Transmitter)
7. Liquid Level Control Four (4) Liquid Level Switches (Fill On/Off, High/Low Level Alarms) by GEMS or equal or Ultrasonic Level Transmitter or Mechanical Float Valve
8. pH Monitoring and Control **(stage one & two)**.....GF Signet
9. ORP Monitoring and Control **(stage two only)** .....GF Signet
10. Immersion heaters for Freeze Protection..... 12 kW (316 Stainless Steel)
11. Incoming Power Supply, Main Panel 460V/3ph/60Hz

12. Control Voltage ..... 110VAC or 24VDC
13. All instrumentation outlined in this section designed to forward a signal to the PLC
14. All applicable scrubber-mounted electrical instrumentation to be pre-wired to a terminal strip housed in a NEMA 4 junction box.

E. Chemical Feed Pump Assembly

1. Quantity of one (1) polypropylene cabinet with clear polycarbonate doors to house 100% redundant chemical feed pump assemblies for (3) separate chemicals (50% NaOH, 15% NaOCl and 36% H2SO4). Pumps to be electric metering type.
2. Chemical Feed Pump Configuration ..... 100% Redundant
3. Total Quantity of Pumps ..... Six (6)
4. Chemical Feed Pump Type ..... Air Diaphragm Pump(s) or Electric Metering Pump(s)
5. Chemical Feed Pump Support Configuration ..White Polypropylene Enclosure with Lexan Door on Steel Stand

F. Interconnecting Ductwork & Exhaust Stack

1. Interconnecting Ductwork between stage (1) and stage (2), as well as from stage (2) outlet to exhaust blower inlet is included, contingent on exhaust blower being located immediately proximal to scrubber on grade.
2. Interconnecting ductwork between scrubber outlet and exhaust blower inlet to be 46" diameter, UV-inhibited white polypropylene construction.
3. Exhaust Stack is to be breach fitted from quantity of (2) exhaust fans (100% redundant).
4. Exhaust stack is to be 56” diameter x 50’ tall
5. Exhaust stack includes isolation dampers and flexible connectors
6. Wind & Seismic calculations are included for the exhaust stack

G. Mechanical Installation of Tri-Mer Equipment and Startup

1. Line item includes the following:
    - Installation of both scrubber columns
    - Installation of 100% redundant exhaust fans
    - Installation of breach fitted exhaust stack
    - Installation of interconnecting exhaust duct
    - System startup
2. Line item includes up to (3) technicians to be onsite for (2) weeks of Monday-Friday work
3. Technicians to be onsite up to 12 hours per day
4. If additional days are needed, additional costs may apply
5. Line item includes necessary lifting equipment to set scrubbers in place
6. Line item includes manlifts as needed
7. Crimson Holding to provide the following:
    - Electrical installation
    - Plant water and drain connections
    - Equipment staging area for the technicians
    - Dumpster for dunnage/material disposal
    - Equipment offloading
    - Stack supports as needed
    - Solid concrete foundation to support scrubber

H. Pre-Assembly and Factory Acceptance Test (FAT) at Tri-Mer Corporation

1. Complete assembly of scrubber system at Tri-Mer factory and headquarters in Owosso, MI. This includes temporary wiring of main electrical panels, instruments, exhaust blowers, recirculation pumps, and other electrical components. A Factory Acceptance Test (FAT) is performed, which includes inducing gas and liquid flow through the system for verification with design values, as well as testing of all instrumentation and control logic features. Clients are invited to visit Tri-Mer to observe this test and go through operational training. Pre-assembly of the system at the factory simplifies field installation due to test fitting and match marking of scrubber components, such as ductwork and exhaust stacks.

IV. Performance Guarantee

A. Removal of SO2 ..... 99.99%
B. Removal of COS 77.90%
C. Removal of NH3 ..... 97.70%

V. Consumables and Specified Operational Minimums

A. 50% NaOH ..... <0.1 gph
B. 36% H_2SO4 ..... 0.4 gph
C. 15% NaOCl ..... TBD
D. Evaporation ..... 155 gph
E. Acidic Waste ..... 0.6 gph
F. Alkaline Waste ..... 0.4 gph
G. Electrical Power ..... 77.3 kW
H. Plant Water ..... 154.7 gph

VI. Items Not Included

A. Building permits
B. Air permits
C. PE stamps
D. Mounting platforms or concrete Pads
E. Supports or catwalk assemblies
F. Utilities, power, water, and drain
G. Electrical Installation
H. Field wiring to the main panel, junction boxes, motors, and instruments
I. Heat tracing and/or insulating of recirculation systems
J. Supply and/or bulk storage of chemicals
K. Interconnecting ductwork to the Scrubber Inlet
L. Freight to the jobsite
M. Duties, taxes, tariffs, or insurance
N. CE documentation of certification
O. Bromine treated lumber for overseas/export crating
P. Seismic calculations, wind loading, foundational loadings, and center of gravity calls

VII. Warranty

TRI-MER® CORPORATION (hereinafter referred to as “Tri-Mer®”) warrants each of the products, manufactured by Tri-Mer®, against manufacturing defects within one year from date of startup or eighteen (18) months from shipment, whichever occurs first. During the first year, a product, or any part thereof deemed defective by Tri-Mer®, may, upon prior approval by Tri-Mer®, be returned to 1400 Monroe Street, Owosso, Michigan 48867.

Appendix 5

EPA-452/F-03-015

Air Pollution Control Technology Fact Sheet

Name of Technology: Packed-Bed/Packed-Tower Wet Scrubber

This type of technology is a part of the group of air pollution controls collectively referred to as "wet scrubbers." When used to control inorganic gases, they may also be referred to as "acid gas scrubbers."

Type of Technology: Removal of air pollutants by inertial or diffusional impaction, reaction with a sorbent or reagent slurry, or absorption into liquid solvent.

Applicable Pollutants:

Primarily inorganic fumes, vapors, and gases (e.g., chromic acid, hydrogen sulfide, ammonia, chlorides, fluorides, and SO_2); volatile organic compounds (VOC); and particulate matter (PM), including PM less than or equal to 10 micrometers (μm) in aerodynamic diameter (PM_{10}), PM less than or equal to 2.5 μm in aerodynamic diameter ($PM_{2.5}$), and hazardous air pollutants (HAP) in particulate form (PM_{HAP}).

Absorption is widely used as a raw material and/or product recovery technique in separation and purification of gaseous streams containing high concentrations of VOC, especially water-soluble compounds such as methanol, ethanol, isopropanol, butanol, acetone, and formaldehyde (Croll Reynolds, 1999). Hydrophobic VOC can be absorbed using an amphiphilic block copolymer dissolved in water. However, as an emission control technique, it is much more commonly employed for controlling inorganic gases than for VOC. When using absorption as the primary control technique for organic vapors, the spent solvent must be easily regenerated or disposed of in an environmentally acceptable manner (EPA, 1991). When used for PM control, high concentrations can clog the bed, limiting these devices to controlling streams with relatively low dust loadings (EPA, 1998).

Achievable Emission Limits/Reductions:

Inorganic Gases: Control device vendors estimate that removal efficiencies range from 95 to 99 percent (EPA, 1993).

VOC: Removal efficiencies for gas absorbers vary for each pollutant-solvent system and with the type of absorber used. Most absorbers have removal efficiencies in excess of 90 percent, and packed-tower absorbers may achieve efficiencies greater than 99 percent for some pollutant-solvent systems. The typical collection efficiency range is from 70 to greater than 99 percent (EPA, 1996a; EPA, 1991).

PM: Packed-bed wet scrubbers are limited to applications in which dust loading is low, and collection efficiencies range from 50 to 95 percent, depending upon the application (EPA, 1998).

Applicable Source Type: Point

Typical Industrial Applications:

The suitability of gas absorption as a pollution control method is generally dependent on the following factors: 1) availability of suitable solvent; 2) required removal efficiency; 3) pollutant concentration in the inlet vapor;

4) capacity required for handling waste gas; and, 5) recovery value of the pollutant(s) or the disposal cost of the unrecoverable solvent (EPA, 1996a). Packed-bed scrubbers are typically used in the chemical, aluminum, coke and ferroalloy, food and agriculture, and chromium electroplating industries. These scrubbers have had limited use as part of flue gas desulfurization (FGD) systems, but the scrubbing solution flow rate must be carefully controlled to avoid flooding (EPA, 1998; EPA, 1981).

When absorption is used for VOC control, packed towers are usually more cost effective than impingement plate towers. However, in certain cases, the impingement plate design is preferred over packed-tower columns when either internal cooling is desired, or where low liquid flow rates would inadequately wet the packing (EPA, 1992).

Emission Stream Characteristics:

a. **Air Flow:** Typical gas flow rates for packed-bed wet scrubbers are 0.25 to 35 standard cubic meters per second (sm^3/sec) (500 to 75,000 standard cubic feet per minute (scfm)) (EPA, 1982; EPA, 1998).

b. **Temperature:** Inlet temperatures are usually in the range of 4 to 370 C (40 to 700 F) for waste gases in which the PM is to be controlled, and for gas absorption applications, 4 to 38 C (40 to 100 F). In general, the higher the gas temperature, the lower the absorption rate, and vice-versa. Excessively high gas temperatures also can lead to significant solvent or scrubbing liquid loss through evaporation. (Avallone, 1996; EPA, 1996a).

c. **Pollutant Loading:** Typical gaseous pollutant concentrations range from 250 to 10,000 ppmv (EPA, 1996a). Packed-bed wet scrubbers are generally limited to applications in which PM concentrations are less than 0.45 grams per standard cubic meter (g/sm^3) (0.20 grains per standard cubic foot (gr/scf)) to avoid clogging (EPA, 1982).

d. **Other Considerations:** For organic vapor HAP control applications, low outlet concentrations will typically be required, leading to impractically tall absorption towers, long contact times, and high liquid-gas ratios that may not be cost-effective. Wet scrubbers will generally be effective for HAP control when they are used in combination with other control devices such as incinerators or carbon adsorbers (EPA, 1991).

Emission Stream Pretreatment Requirements:

For absorption applications, precoolers (e.g., spray chambers, quenchers) may be needed to saturate the gas stream or to reduce the inlet air temperature to acceptable levels to avoid solvent evaporation or reduced absorption rates (EPA, 1996a).

Cost Information:

The following are cost ranges (expressed in 2002 dollars) for packed-bed wet scrubbers of conventional design under typical operating conditions, developed using EPA cost-estimating spreadsheets (EPA, 1996a) and referenced to the volumetric flow rate of the waste stream treated. For purposes of calculating the example cost effectiveness, the pollutant used is hydrochloric acid and the solvent is aqueous caustic soda. The costs do not include costs for post-treatment or disposal of used solvent or waste. Costs can be substantially higher than in the ranges shown for applications which require expensive materials, solvents, or treatment methods. As a rule, smaller units controlling a low concentration waste stream will be much more expensive (per unit volumetric flow rate) than a large unit cleaning a high pollutant load flow.

a. **Capital Cost:** $23,000 to $117,000 per sm^3/sec ($11 to $55 per scfm)

b. **O & M Cost:** $32,000 to $104,000 per sm^3/sec ($15 to $49 per scfm), annually

c. **Annualized Cost:** $36,000 to $165,000 per sm^3/sec ($17 to $78 per scfm), annually

d. **Cost Effectiveness:** $110 to $550 per metric ton ($100 to $500 per short ton), annualized cost per ton per year of pollutant controlled

Theory of Operation:

Packed-bed scrubbers consist of a chamber containing layers of variously-shaped packing material, such as Raschig rings, spiral rings, or Berl saddles, that provide a large surface area for liquid-particle contact. The packing is held in place by wire mesh retainers and supported by a plate near the bottom of the scrubber. Scrubbing liquid is evenly introduced above the packing and flows down through the bed. The liquid coats the packing and establishes a thin film. The pollutant to be absorbed must be soluble in the fluid. In vertical designs (packed towers), the gas stream flows up the chamber (countercurrent to the liquid). Some packed beds are designed horizontally for gas flow across the packing (crosscurrent) (EPA, 1998).

Physical absorption depends on properties of the gas stream and liquid solvent, such as density and viscosity, as well as specific characteristics of the pollutant(s) in the gas and the liquid stream (e.g., diffusivity, equilibrium solubility). These properties are temperature dependent, and lower temperatures generally favor absorption of gases by the solvent. Absorption is also enhanced by greater contacting surface, higher liquid-gas ratios, and higher concentrations in the gas stream (EPA, 1991). Chemical absorption may be limited by the rate of reaction, although the rate-limiting step is typically the physical absorption rate, not the chemical reaction rate (EPA, 1996a; EPA, 1996b).

Inorganic Gases Control:

Water is the most common solvent used to remove inorganic contaminants. Pollutant removal may be enhanced by manipulating the chemistry of the absorbing solution so that it reacts with the pollutant. Caustic solution (sodium hydroxide, NaOH) is the most common scrubbing liquid used for acid-gas control (e.g., HCl, SO_2, or both), though sodium carbonate (Na_2CO_3) and calcium hydroxide (slaked lime, $Ca[OH]_2$) are also used. When the acid gases are absorbed into the scrubbing solution, they react with alkaline compounds to produce neutral salts. The rate of absorption of the acid gases is dependent upon the solubility of the acid gases in the scrubbing liquid (EPA, 1996a; EPA, 1996b).

VOC Control:

Absorption is a commonly applied operation in chemical processing. It is used as a raw material and/or a product recovery technique in separation and purification of gaseous streams containing high concentrations of organics (e.g., in natural gas purification and coke by-product recovery operations). In absorption, the organics in the gas stream are dissolved in a liquid solvent. The contact between the absorbing liquid and the vent gas is accomplished in counter current spray towers, scrubbers, or packed or plate columns (EPA, 1995).

The use of absorption as the primary control technique for organic vapors is subject to several limiting factors. One factor is the availability of a suitable solvent. The VOC must be soluble in the absorbing liquid and even then, for any given absorbent liquid, only VOC that are soluble can be removed. Some common solvents that may be useful for volatile organics include water, mineral oils, or other nonvolatile petroleum oils. Another factor that affects the suitability of absorption for organic emissions control is the availability of vapor/liquid equilibrium data for the specific organic/solvent system in question. Such data are necessary for the design of absorber systems; however, they are not readily available for uncommon organic compounds.

The solvent chosen to remove the pollutant(s) should have a high solubility for the vapor or gas, low vapor pressure, low viscosity, and should be relatively inexpensive. Water is used to absorb VOC having relatively high water solubilities. Amphiphilic block copolymers added to water can make hydrophobic VOC dissolve in water. Other solvents such as hydrocarbon oils are used for VOC that have low water solubilities, though only in industries where large volumes of these oils are available (e.g., petroleum refineries and petrochemical plants) (EPA, 1996a).

Another consideration in the application of absorption as a control technique is the treatment or disposal of the material removed from the absorber. In most cases, the scrubbing liquid containing the VOC is regenerated in an operation known as stripping, in which the VOC is desorbed from the absorbent liquid, typically at elevated temperatures and/or under vacuum. The VOC is then recovered as a liquid by a condenser (EPA, 1995).

PM Control:

In packed-bed scrubbers, the gas stream is forced to follow a circuitous path through the packing material, on which much of the PM impacts. The liquid on the packing material collects the PM and flows down the chamber towards the drain at the bottom of the tower. A mist eliminator (also called a “de-mister”) is typically positioned above/after the packing and scrubbing liquid supply. Any scrubbing liquid and wetted PM entrained in the exiting gas stream will be removed by the mist eliminator and returned to drain through the packed bed.

In a packed-bed scrubber, high PM concentrations can clog the bed, hence the limitation of these devices to streams with relatively low dust loadings. Plugging is a serious problem for packed-bed scrubbers because the packing is more difficult to access and clean than other scrubber designs. Mobile-bed scrubbers are available that are packed with low-density plastic spheres that are free to move within the packed bed. These scrubbers are less susceptible to plugging because of the increased movement of the packing material. In general, packed-bed scrubbers are more suitable for gas scrubbing than PM scrubbing because of the high maintenance requirements for control of PM (EPA, 1998).

Advantages:

Advantages of packed-bed towers include (AWMA, 1992):

1. Relatively low pressure drop;
2. Fiberglass-reinforced plastic (FRP) construction permits operation in highly corrosive atmospheres;
3. Capable of achieving relatively high mass-transfer efficiencies;
4. The height and/or type of packing can be changed to improve mass transfer without purchasing new equipment;
5. Relatively low capital cost;
6. Relatively small space requirements; and
7. Ability to collect PM as well as gases.

Disadvantages:

Disadvantages of packed-bed towers include (AWMA, 1992):

1. May create water (or liquid) disposal problem;
2. Waste product collected wet;
3. PM may cause plugging of the bed or plates;
4. When FRP construction is used, it is sensitive to temperature; and

5. Relatively high maintenance costs.

Other Considerations:

For gas absorption, the water or other solvent must be treated to remove the captured pollutant from the solution. The effluent from the column may be recycled into the system and used again. This is usually the case if the solvent is costly (e.g., hydrocarbon oils, caustic solutions, amphiphilic block copolymer). Initially, the recycle stream may go to a treatment system to remove the pollutants or the reaction product. Make-up solvent may then be added before the liquid stream reenters the column (EPA, 1996a).

For PM applications, wet scrubbers generate waste in the form of a slurry. This creates the need for both wastewater treatment and solid waste disposal. Initially, the slurry is treated to separate the solid waste from the water. The treated water can then be reused or discharged. Once the water is removed, the remaining waste will be in the form of a solid or sludge. If the solid waste is inert and nontoxic, it can generally be landfilled. Hazardous wastes will have more stringent procedures for disposal. In some cases, the solid waste may have value and can be sold or recycled (EPA, 1998).

Configuring a control device that optimizes control of more than one pollutant often does not achieve the highest control possible for any of the pollutants controlled alone. For this reason, waste gas flows which contain multiple pollutants (e.g., PM and SO_2, or PM and inorganic gases) are generally controlled with multiple control devices, occasionally more than one type of wet scrubber (EC/R, 1996).

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Appendix 6

ODOR CONTROL–ODOR NEUTRALIZER
OC9118

GENERAL DESCRIPTION

CHEMTREAT OC9118 is a highly effective concentrated multicomponent blend of odor neutralizing compounds. **OC9118** is specifically formulated to eliminate nuisance odors when applied using mist spray technology. Unlike masking agents that overwhelm the malodor and actually increase overall odor intensity, **OC9118** decreases overall odor intensity.

TYPICAL PHYSICAL PROPERTIES

Form:	Clear, pink liquid
Odor:	Moderate
Viscosity:	< 100 CPS @ 20° C
pH:	~7.2
Specific Gravity:	1.003 @ 20°C
Density:	8.37 lbs/gal
Freeze Point:	32°F

Please see the **OC9118 SDS for specifics regarding safety and handling.*

FEEDING, DOSAGE AND CONTROL

Feed System

OC9118 is pre-mixed with water and fed at a typical dilution rate of 1 part product to 200–300 parts of water. The solution must be delivered through a properly designed feed system to ensure desired efficacy. Proper atomization of vapor allows intimate and thorough mixing with the malodor. ChemTreat representatives are trained to assist with specific applications.

Dosage

The dosage of **OC9118** depends on the level of nuisance malodor. Feed rates should be established with the guidance of a ChemTreat representative. Store above freeze point. If **OC9118** freezes, then thaw and mechanical mixing is required.

SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat OC9118
Product Use:	Odor Control
Supplier's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800)424−9300 (Toll Free)
Address (Corporate Headquarters):	5640 Cox Road Glen Allen, VA 23060
Telephone Number for Information:	(800)648−4579
Date of SDS:	February 7, 2019
Revision Date:	February 7, 2019
Revision Number:	19020701AN

Section 2. Hazard(s) Identification

Signal Word: **None**

GHS Classification(s): Non−Hazardous Substance

Hazard Statement(s): Non−Hazardous Substance

Precautionary Statement(s): No significant health risks are expected from exposures under normal conditions of use.

- **Prevention:** None.
- **Response:** None.
- **Storage:** None.
- **Disposal:** None.

System of Classification Used: Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

Hazards Not Otherwise Classified: None.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
Components not listed are either non hazardous or in concentration of less than 1%	N/A	N/A

Comments If chemical identity and/or exact percentage of composition has been withheld, this information is considered to be a trade secret.

Section 4. First Aid Measures

Inhalation: Call a POISON CENTER or doctor/physician if you feel unwell.

Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

Skin: Call a poison center or doctor/physician if you feel unwell.

Ingestion: Rinse mouth. Call a poison center or doctor/physician if you feel unwell.

Most Important Symptoms: N/D

Indication of Immediate Medical Attention and Special Treatment Needed, If Necessary: N/A

Section 5. Fire Fighting Measures

Flammability of the Product: Not flammable.

Suitable Extinguishing Media: Use extinguishing media suitable to surrounding fire.

Specific Hazards Arising from the Chemical: None known.

Protective Equipment: If product is involved in a fire, wear full protective clothing including a positive−pressure, NIOSH approved, self−contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions: Use appropriate Personal Protective Equipment (PPE).

Environmental Precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains, and sewers.

Methods for Cleaning up: Contain and recover liquid when possible. Flush spill area with water spray.

Other Statements: None.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protective Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.
Protect from heat and sources of ignition.
Do not freeze. Store above Freeze Point. If freezes, then mechanical mixing is required.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
Components not listed are either non hazardous or in concentration of less than 1%	N/E	N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes:	Safety glasses are recommended if risk of eye contact.
Skin:	Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.
Respiratory:	If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Pink, Clear
Specific Gravity:	1.003 @ 20°C
pH:	7.2 @ 20°C, 100.0%
Freezing Point:	32°F
Flash Point:	N/A
Odor:	Moderate
Melting Point:	N/A
Initial Boiling Point and Boiling Range:	>212°F
Solubility in Water:	Complete
Evaporation Rate:	N/D
Vapor Density:	N/D
Molecular Weight:	N/D
Viscosity:	<100 CPS @ 20°C
Flammability (solid, gas):	N/D
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	8.37 LB/GA
Vapor Pressure:	N/D
% VOC:	N/D
Odor Threshold	N/D
n−octanol Partition Coefficient	N/D
Decomposition Temperature	N/D

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Strong oxidizers.

Hazardous Decomposition Products: Oxides of carbon.

Possibility of Hazardous Reactions: None known.

Reactivity: N/D

Conditions To Avoid: N/D

Section 11. Toxicological Information

Acute Toxicity

Chemical Name	Exposure	Type of Effect	Concentration	Species
ChemTreat OC9118	N/D	N/D	N/D	N/D

Carcinogenicity Category

Component	Source	Code	Brief Description
Components not listed are either non hazardous or in concentration of less than 1%	N/E	N/E	N/E

Likely Routes of Exposure: N/D

Symptoms

Inhalation: N/D

Eye Contact: N/D

Skin Contact: N/D

Ingestion: N/D

Skin Corrosion/Irritation: N/D

Serious Eye Damage/Eye Irritation: N/D

Sensitization: N/D

Germ Cell Mutagenicity: N/D

Reproductive/Developmental Toxicity: N/D

Specific Target Organ Toxicity

Single Exposure: N/D

Repeated Exposure: N/D

Aspiration Hazard: N/D

Comments: None.

Section 12. Ecological In ormatio

Ecotoxicity

Species	Duration	Type of Effect	Test Results
N/D	N/D	N/D	N/D

Persistence and Biodegradability: N/D

Bioaccumulative Potential: N/D

Mobility In Soil: N/D

Other Adverse Effects: N/D

Comments: Not tested.

Section 13. Disposal Considerations

Dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information

Controlling Regulation	UN/NA#:	Proper Shipping Name:	Technical Name:	Hazard Class:	Packing Group:
DOT	N/A	COMPOUND, INDUSTRIAL WATER TREATMENT, LIQUID	N/A	N/A	N/A

Note: N/A

Section 15. Regulatory Information

Inventory Status

United States (TSCA): All ingredients listed.
Canada (DSL/NDSL): All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard: No
Reactive Hazard: No
Release of Pressure: No
Acute Health Hazard: Yes
Chronic Health Hazard: No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
Components not listed are either non hazardous or in concentration of less than 1%	N/A	N/A	N/A

Comments: None.

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
Components not listed are either non hazardous or in concentration of less than 1%	None.

Compliance Information

NSF: N/A

Food Regulations: N/A

KOSHER: This product has not been evaluated for Kosher approval.

Halal: This product has not been evaluated for Halal approval.

FIFRA: N/A

Other: None

Comments: None.

Section 16. Other In ormatio n

HMIS Hazard Rating

Health: 0
Flammability: 0
Physical Hazard: 0
PPE: X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha−numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end−user must determine if the code is appropriate for their use.

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Product Compliance Department; ProductCompliance@chemtreat.com

Revision Date: February 7, 2019

Disclaimef

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THE TOTAL ORGANIC CHEMICAL CONTENT (OC AND VOC)

CAS	Description	Quantity
8050-15-5	ABALYN	<0.01%
111-87-5	ALCOHOL C-08 (SEE CAPRYL ALC.)	<0.01%
112-45-8	ALDEHYDE C-11 EN	<0.01%
112-44-7	ALDEHYDE C-11 UNDECYLIC	<0.01%
104-61-0	ALDEHYDE C-18	<0.01%
628-63-7	AMYL ACETATE	0.01 – 0.10%
106-27-4	AMYL BUTYRATE	<0.01%
122-40-7	AMYL CINNAMIC ALDEHYDE	<0.01%
4180-23-8	ANETHOL	<0.01%
123-11-5	ANISIC ALDEHYDE	<0.01%
100-52-7	BENZALDEHYDE	<0.01%
140-11-4	BENZYL ACETATE	0.01 – 0.10%
111-76-2	BUTYL CELLOSOLVE	0.5 – 1.00%
6485-40-1	CARVACROL TECH	<0.01%
68990-83-0	CEDARWOOD TEXAS	<0.01%
104-55-2	CINNAMIC ALDEHYDE	<0.01%
8000-29-1	CITRONELLA CEYLON	0.01 – 0.10%
8015-97-2	CLOVE LEAF OIL	<0.01%
68917-29-3	CLOVE TERPENES	0.01 – 0.10%
91-64-5	COUMARIN	<0.01%
103-95-7	CYCLAMEN ALDEHYDE	<0.01%
84-66-2	DIETHYLPHTHALATE	0.01 – 0.10%
5989-27-5	LIMONENE D	0.1 – 0.5%
68956-56-9	DIPENTENE PG	0.01 – 0.10%
101-84-8	DIPHENYL OXIDE	<0.01%
141-78-6	ETHYL ACETATE	0.01 – 0.10%
105-54-4	ETHYL BUTYRATE	0.01 – 0.10%
8000-48-4	EUCALYPTUS 80/85	<0.01%
97-53-0	EUGENOL	0.01 – 0.10%
106-24-1	GERANIOL BJ	0.01 – 0.10%
8050-15-5	HERCOLYN D	0.01 – 0.10%
9036-19-5	IGEPAL CA630	1.0 – 6.0%
125-12-2	ISO BORNYL ACETATE	0.01 – 0.10%
8016-78-2	LAVENDER SPIKE	<0.01%

8007-02-1	LEMON GRASS OIL (GUATAMALA)	0.01 – 0.10%
78-70-6	LINALOOL 925	<0.01%
134-20-3	METHYL ANTHRANILATE	0.01 – 0.10%
111-13-7	METHYL HEXYL KETONE	<0.01%
1335-46-2	METHYL IONONE GAMMA SUPREME	<0.01%
119-36-8	METHYL SALICYLATE	0.01 – 0.10%
81-14-1	MUSK KETONE	<0.01%
8008-57-9	ORANGE OIL VALENCIA	<0.01%
103-82-2	PHENYL ACETIC ACID	<0.01%
60-12-8	PHENYL ETHYL ALCOHOL	<0.01%
8006-77-6	PIMENTO LEAF OIL	<0.01%
8000-25-7	ROSEMARY SPANISH	<0.01%
93-92-5	STYRALLYL ACETATE	<0.01%
98-55-5	TERPINEOL 900	0.1 – 0.5%
80-26-2	TERPINYL ACETATE	0.1 – 0.5%
8002-09-3	UNIPINE 85	0.01 – 0.10%
121-33-5	VANILLIN	0.01 – 0.10%
32388-55-9	VERTOFIX	<0.01%
93-04-9	YARA YARA	<0.01%

PathoCide

Safety Data Sheet

According to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations and According to the Hazardous Products Regulation (February 11, 2015).

Revision Date: 07/05/2021 Date of Issue: 7/5/2021 Version: 4

SECTION 1: IDENTIFICATION

Product Identifier

Product Form: Mixture

Product Name: PathoCide [generated on-site]

Synonyms: Hypochlorous Acid Solution

Intended Use of the Product

Sanitizer - Disinfectant as produced by appropriately regulated on-site generator.

Name, Address, and Telephone of the Responsible Party

Company

PathoSans from Spraying Systems Co.
100 W. Lake Drive
Glendale Heights, IL 60139
833-553-2648
www.pathosans.com

Emergency Telephone Number

Emergency Number : 1-800-424-9300/+1 703-527-3887

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture

GHS-US/CA Classification

This substance does not meet the definition of a hazardous substance or preparation as defined by the OSHA and described in 29 CFR 1910.1200(d).

Label Elements

GHS-US/CA Labeling

Hazard Pictograms (GHS-US/CA) : None
Signal Word (GHS-US/CA) : None
Hazard Statements (GHS-US/CA) : None
Precautionary Statements (GHS-US/CA) : None

Other Hazards

Exposure may aggravate pre-existing eye, skin, or respiratory conditions.

Unknown Acute Toxicity (GHS-US/CA)

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product Identifier	% *	GHS Ingredient Classification
Water	(CAS No) 7732-18-5	99.97-99.9835	Not classified
Hypochlorous acid	(CAS No) 7790-92-3	0.0165-.0300	Not classified

Full text of H-phrases: see section 16

*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

SECTION 4: FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: If symptoms occur: Go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

Skin Contact: If symptoms occur: Remove contaminated clothing. Rinse affected area with water for at least 5 minutes. Obtain medical attention if irritation develops or persists.

Eye Contact: If symptoms occur: Rinse cautiously with water for at least 5 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if redness, pain, or irritation occurs.

Ingestion: If symptoms occur: Rinse mouth. Do NOT induce vomiting. Obtain medical attention.

Most Important Symptoms and Effects Both Acute and Delayed

General: Not expected to present a significant hazard under anticipated conditions of normal use.

Inhalation: Prolonged exposure may cause irritation.

Skin Contact: Prolonged exposure may cause skin irritation.

Eye Contact: May cause slight irritation to eyes.

Ingestion: Ingestion may cause adverse effects.

Chronic Symptoms: None expected under normal conditions of use.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Water spray, dry chemical, foam, carbon dioxide.

Unsuitable Extinguishing Media: Do not use a heavy water stream. Use of heavy stream of water may spread fire.

Special Hazards Arising from the Substance or Mixture

Fire Hazard: Not flammable.

Explosion Hazard: Product is not explosive.

Reactivity: May be corrosive to metals. Contact with metals may evolve flammable hydrogen gas. May emit chlorine gas when mixed with acids or ammonia.

Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire.

Firefighting Instructions: Use water spray or fog for cooling exposed containers.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Irritating or toxic vapors.

Reference to Other Sections

Refer to Section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Avoid prolonged contact with eyes, skin and clothing. Avoid breathing (vapor, mist, spray).

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit. Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters.

Methods and Materials for Containment and Cleaning Up

For Containment: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.

Methods for Cleaning Up: Clean up spills immediately and dispose of waste safely. Transfer spilled material to a suitable container for disposal. Contact competent authorities after a spill. Absorb spillage to prevent material damage.

Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards When Processed: May be corrosive to metals.

Precautions for Safe Handling: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Avoid prolonged contact with eyes, skin and clothing. Avoid breathing vapors, mist, spray.
Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations.
Storage Conditions: Keep container closed when not in use. Store in a dry, cool place. Keep/Store away from direct sunlight, extremely high or low temperatures and incompatible materials. Store in corrosive resistant container with a resistant inner liner.
Incompatible Materials: Strong acids, strong bases, strong oxidizers.

Specific End Use(s)

Sanitizer - Disinfectant as produced by appropriately registered device.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

For substances listed in section 3 that are not listed here, there are no established exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), Canadian provincial governments, or the Mexican government.

Exposure Controls

Appropriate Engineering Controls: Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed.

Materials for Protective Clothing: Not required for normal conditions of use. As conditions warrant: Gloves. Protective clothing. Protective goggles.

Hand Protection: Wear protective gloves.

Eye Protection: Chemical goggles or safety glasses.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Other Information: When using, do not eat, drink, or smoke

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Liquid
Appearance	:	Clear
Odor	:	Slight chlorine odor, no fragrance added
Odor Threshold	:	Not available
pH	:	4.5 – 6.5
Evaporation Rate	:	Not available
Melting Point	:	Not available
Freezing Point	:	0 °C (32 °F)
Boiling Point	:	100 °C (212 °F)
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20°C	:	Not available
Relative Density	:	Not available
Specific Gravity	:	1
Solubility	:	Water: Soluble
Partition Coefficient: N-Octanol/Water	:	Not available

Viscosity : 1.3 cP

SECTION 10: STABILITY AND REACTIVITY

Reactivity: May be corrosive to metals. Contact with metals may evolve flammable hydrogen gas. May emit chlorine gas when mixed with acids or ammonia.

Chemical Stability: Stable under recommended handling and storage conditions (see section 7).

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Direct sunlight, extremely high or low temperatures, and incompatible materials.

Incompatible Materials: Strong acids, strong bases, strong oxidizers. Metals. May be corrosive to metals. Ammonia.

Hazardous Decomposition Products: None known.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity (Oral): Not classified
Acute Toxicity (Dermal): Not classified
Acute Toxicity (Inhalation): Not classified
LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Not classified
pH: 4.5 – 6.5

Eye Damage/Irritation: Not classified
pH: 4.5 – 6.5

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Carcinogenicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: Prolonged exposure may cause irritation.
Symptoms/Injuries After Skin Contact: Prolonged exposure may cause skin irritation.
Symptoms/Injuries After Eye Contact: May cause slight irritation to eyes.
Symptoms/Injuries After Ingestion: Ingestion may cause adverse effects.
Chronic Symptoms: None expected under normal conditions of use.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data: Not available

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecology - General: Not classified.

Persistence and Degradability

PathoCide	
Persistence and Degradability	Not established.

Bioaccumulative Potential

PathoCide	
Bioaccumulative Potential	Not established.

Mobility in Soil

Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

Additional Information: Container may remain hazardous when empty. Continue to observe all precautions.

Ecology - Waste Materials: Avoid release to the environment.

SECTION 14: TRANSPORT INFORMATION

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued.

In Accordance with DOT

This product is classified (per 49 CFR 173.137) by the U.S. Department of Transportation, as follows.

Proper Shipping Name : Non-Regulated Material
Hazard Class : None
Identification Number : None
Label Codes : None
Packing Group : N/A
ERG Number : N/A

SECTION 15: REGULATORY INFORMATION

US Federal Regulations

Water (7732-18-5)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Hypochlorous acid (7790-92-3)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

Neither this product nor its chemical components appear on any US state lists.

Canadian Regulations

Water (7732-18-5)
Listed on the Canadian DSL (Domestic Substances List)

Hypochlorous acid (7790-92-3)
Listed on the Canadian NDSL (Non-Domestic Substances List)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision Date : 07/05/2021

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada's Hazardous Products Regulations (HPR).

GHS Full Text Phrases:

Met. Corr. 1	Corrosive to metals Category 1
H290	May be corrosive to metals

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

NA GHS SDS 2015 (US, Can, Mex)

Appendix 7

Table 1
Overall Emissions Summary
EU-Spray Dryer - June 21, 2022

Method	Pollutant	Emission Concentration (ppmv)	Emission Rate (lb/hr)
CMT-027	Ammonia	11.4 ppmv, dry	0.66
Method 25A	THC, as Methane	14.99 ppmv, wet	0.88
ASTM D5504	COS/SO_2	0.604 ppmv, wet	0.142

Table 2
EU-Spray Dryer Ammonia Emission Rates

Client	**Crimson Holdings**				
Source	**EU-Spray Dryer Exhaust**				
Test Information					
Test Number	1	2	3	Average	Average
Test Date	6/21/2022	6/21/2022	6/21/2022	Runs 1-3	Runs 1 and 3
Run Start Time	11:26	15:00	17:08		
Run Finish Time	12:46	16:14	18:15	*Run 2 post leak check QA failed.*	
Net Traverse Points	24	24	24	*Average results are presented as both*	
Net Run Time, Minutes	60	60	60	*including and excluding Run 2*	
Meter/Nozzle Information					
Meter Temperature Tm (F)	100.4	103.5	103.4	102.4	
Meter Pressure - Pm (in. Hg)	29.3	29.3	29.3	29.3	
Measured Sample Volume (Vm)	42.8	40.7	41.5	41.7	
Sample Volume (Vm-Std ft^3)	38.4	36.2	37.0	37.2	
Sample Volume (Vm-Std m^3)	1.09	1.03	1.05	1.05	
Condensate Volume (Vw-std)	4.225	4.130	4.031	4.129	
Gas Density (Ps(std) lbs/ft^3) (wet)	0.0726	0.0725	0.0726	0.0726	
Gas Density (Ps(std) lbs/ft^3) (dry)	0.0755	0.0755	0.0755	0.0755	
Total weight of sampled gas (m g lbs) (wet)	3.10	2.92	2.98	3.00	
Total weight of sampled gas (m g lbs) (dry)	2.90	2.73	2.79	2.81	
Nozzle Size - An (sq. ft.)	0.000562	0.000562	0.000562	0.000562	
Isokinetic Variation - I	100.8	102.6	101.8	101.7	
Stack Data					
Average Stack Temperature - Ts (F)	162.0	165.3	165.4	164.2	
Molecular Weight Stack Gas- dry (Md)	29.1	29.1	29.1	29.1	
Molecular Weight Stack Gas-wet (Ms)	28.0	28.0	28.0	28.0	
Stack Gas Specific Gravity (Gs)	0.966	0.966	0.966	0.966	
Percent Moisture (Bws)	9.91	10.24	9.83	9.99	
Water Vapor Volume (fraction)	0.0991	0.1024	0.0983	0.0999	
Pressure - Ps ("Hg)	29.2	29.1	29.1	29.2	
Average Stack Velocity -Vs (ft/sec)	25.2	23.6	24.2	24.4	
Area of Stack (ft^2)	19.6	19.6	19.6	19.6	
Exhaust Gas Flowrate					
Flowrate ft^3(Actual)	29,712	27,819	28,494	28,675	
Flowrate ft^3 (Standard Wet)	24,620	22,881	23,434	23,645	
Flowrate ft^3 (Standard Dry)	22,181	20,537	21,129	21,283	
Flowrate m^3 (standard dry)	628	582	598	603	
Total Ammonia Weight (µg)					
Sample Catch (Impinger 1)	8,800	8,100	8,200	*8,367*	8,500
Sample Catch (Impingers 2+3)	130	150	110	*130*	120
Blank correction	0	0	0	*0*	0
Total	8,930	8,250	8,310	*8,497*	8,620
Total Ammonia Concentration					
lb/1000 lb (wet)	0.006	0.006	0.006	*0.006*	0.006
lb/1000 lb (dry)	0.007	0.007	0.007	*0.007*	0.007
mg/dscm (dry)	8.2	8.0	7.9	*8.1*	8.1
PPM (dry)	11.6	11.4	11.2	*11.4*	11.4
Total Ammonia Emission Rate					
lb/ hr	0.68	0.62	0.63	*0.65*	0.66

Table 3
EU-Spray Dryer THC Emission Rates

Client **Crimson Holdings**
Source **EU-Spray Dryer Exhaust**

	Run 1	Run 2	Run 3	Average
Test Date	6/21/2022	6/21/2022	6/21/2022	
Test Time	11:26-12:30	15:00-16:15	17:08-18:15	
Outlet Flowrate (scfm)	24,620	22,881	23,434	**23,645**
VOC Concentration (ppmv as Methane)	14.15	15.29	15.65	**15.03**
VOC Emission Rate as Methane (lb/hr)	0.87	0.87	0.92	**0.89**
VOC Concentration (ppmv as Methane)(7E corrected)	14.35	14.91	15.71	**14.99**
VOC Emission Rate as Methane (lb/hr) (7E corrected)	0.88	0.85	0.92	**0.88**

scfm = standard cubic feet per minute
ppmv = parts per million on a volume-to-volume basis
lb/hr = pounds per hour
MW = molecular weight (CH_4= 16.04)
24.055 = molar volume of air at standard conditions (68^{o}F, 29.92" Hg)
35.31 = ft^3 per m^3
453,600 = mg per lb

Equations
lb/hr = ppmv * MW/24.055 * 1/35.31 * 1/453,600 * ***scfm*** * 60 *for* VOC

Table 4
EU-Spray Dryer Speciated Amines Emission Rates

Client			**Crimson Holdings**							
Source			**EU-Spray Dryer Exhaust**							
Test Information										
Test Number			1		2		3			
Test Date			6/21/2022		6/21/2022		6/21/2022			
Run Start Time			11:31		15:01		17:08			
Run Finish Time			12:31		16:01		18:08			
Net Run Time, Minutes			60		60		60			
Sample Volume Information										
Stack Temperature (F)			162.0		165.3		165.4		164.2	
Stack Pressure - (in. Hg)			29.20		29.14		29.14		29.16	
2-Scan: Pre-test Drycal Flow Rate (L/min)			0.50454		0.52440		0.48969			
2-Scan: Post-test Drycal Flow Rate (L/min)			0.34124		0.48234		0.48631			
2-Scan: Average Flow Rate (L/min)			0.42289		0.50337		0.48800		0.47142	
2-Scan: Measured Sample Volume (Vm- L)			25.4		30.2		29.3		28.3	
2-Scan: Sample Volume (Vm-Std L)			21.0		24.1		23.4		22.8	
2-Scan: Sample Volume (Vm-Std L) (dry)			18.9		21.7		21.1		20.6	
3-Scan: Pre-test Drycal Flow Rate (L/min)			0.58246		0.54681		0.55681			
3-Scan: Post-test Drycal Flow Rate (L/min)			0.56350		0.54333		0.54540			
3-Scan: Average Flow Rate (L/min)			0.57298		0.54507		0.55111		0.55639	
3-Scan: Measured Sample Volume (Vm- L)			34.4		32.7		33.1		33.4	
3-Scan: Sample Volume (Vm-Std L)			28.5		26.9		27.2		27.5	
3-Scan: Sample Volume (Vm-Std L) (dry)			25.7		24.1		24.5		24.8	
Exhaust Gas Flowrate										
Flowrate ft^3/min (Standard Dry)			22,181		20,537		21,129		21,283	
Speciate Amines Weights (µg)										
	CAS #	MW								
2-Scan: Ethylamine	75-04-7	45.085	<	2.0	<	2.0	<	2.0	<	2.0
2-Scan: Diethylamine	109-89-7	73.139	<	2.0	<	2.0	<	2.0	<	2.0
2-Scan: Methylamine	74-89-5	31.058	<	3.0	<	3.0	<	3.0	<	3.0
2-Scan: Dimethylamine	124-40-3	45.085	<	3.0	<	3.0	<	3.0	<	3.0
3-Scan: n-Butylamine	109-73-9	73.139	<	1.0	<	1.0	<	1.0	<	1.0
3-Scan: Isopropylamine	75-31-0	59.112	<	1.0	<	1.0	<	1.0	<	1.0
3-Scan: Cyclohexylamine	108-91-8	99.17	<	1.0	<	1.0	<	1.0	<	1.0
3-Scan: Triethylamine	121-44-8	101.193	<	1.0	<	1.0	<	1.0	<	1.0
		Totals	<	14.0	<	14.0	<	14.0	<	14.0
Speciated Amines Concentrations (PPMV, dry)										
Ethylamine			<	0.06	<	0.05	<	0.05	<	0.05
Diethylamine			<	0.03	<	0.03	<	0.03	<	0.03
Methylamine			<	0.12	<	0.11	<	0.11	<	0.11
Dimethylamine			<	0.08	<	0.07	<	0.08	<	0.08
Butylamine			<	0.01	<	0.01	<	0.01	<	0.01
Isopropylamine			<	0.02	<	0.02	<	0.02	<	0.02
Cyclohexylamine			<	0.01	<	0.01	<	0.01	<	0.01
Triethylamine			<	0.01	<	0.01	<	0.01	<	0.01
			<	0.35	<	0.31	<	0.32	<	0.32
Speciated Amines Emission Rates (lb/hr)										
Ethylamine			<	0.01	<	0.01	<	0.01	<	0.01
Diethylamine			<	0.01	<	0.01	<	0.01	<	0.01
Methylamine			<	0.01	<	0.01	<	0.01	<	0.01
Dimethylamine			<	0.01	<	0.01	<	0.01	<	0.01
Butylamine			<	0.00	<	0.00	<	0.00	<	0.00
Isopropylamine			<	0.00	<	0.00	<	0.00	<	0.00
Cyclohexylamine			<	0.00	<	0.00	<	0.00	<	0.00
Triethylamine			<	0.00	<	0.00	<	0.00	<	0.00
			<	0.06	<	0.05	<	0.05	<	0.05

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Table 5
EU-Spray Dryer Speciated Sulfur Compounds Emission Rates

Client			**Crimson Holdings**			
Source			**EU-Spray Dryer Exhaust**			
Test Information						
Test Number			1	2	3	
Test Date			6/21/2022	6/21/2022	6/21/2022	
Run Start Time			11:31	15:01	17:08	
Run Finish Time			12:31	15:55	18:08	
Net Run Time, Minutes			60	54	60	
Exhaust Gas Flowrate						
Flowrate ft^3/min (Standard Wet)			24,620	22,881	23,434	23,645
Speciated Sulfur Compounds (PPMV, wet)						
	CAS #	MW				
Hydrogen Sulfide	2148878	34.08	< 0.082	< 0.092	< 0.083	< 0.086
Carbonyl Sulfide / Sulfur Dioxide	463-58-1 / 7446-09-5	60.08 / 64.07	0.516	0.614	0.682	0.604
Methyl Mercaptan	74-93-1	48.11	< 0.082	< 0.092	< 0.083	< 0.086
Ethyl Mercaptan	64132	62.13	< 0.082	< 0.092	< 0.083	< 0.086
Dimethyl Sulfide	75-18-3	62.13	< 0.082	< 0.092	< 0.083	< 0.086
Carbon Disulfide	75-15-0	76.13	< 0.082	< 0.092	< 0.083	< 0.086
Isopropyl Mercaptan	75-33-2	76.16	< 0.082	< 0.092	< 0.083	< 0.086
tert-Butyl Mercaptan	75-66-1	90.18	< 0.082	< 0.092	< 0.083	< 0.086
n-Propyl Mercaptan	107-03-9	76.16	< 0.082	< 0.092	< 0.083	< 0.086
Methylethylsulfide	624-89-5	76.16	< 0.082	< 0.092	< 0.083	< 0.086
sec-Butyl Mercaptan / Thiophene	513-53-1 / 110-02-1	90.19 / 84.14	< 0.082	< 0.092	< 0.083	< 0.086
iso-Butyl Mercaptan	513-44-0	90.19	< 0.082	< 0.092	< 0.083	< 0.086
Diethyl Sulfide	352-93-2	90.19	< 0.082	< 0.092	< 0.083	< 0.086
n-Butyl Mercaptan	109-79-5	90.19	< 0.082	< 0.092	< 0.083	< 0.086
Dimethyl Disulfide	624-92-0	94.2	< 0.082	< 0.092	< 0.083	< 0.086
2-Methylthiophene	554-14-3	98.17	< 0.082	< 0.092	< 0.083	< 0.086
3-Methylthiophene	616-44-4	98.17	< 0.082	< 0.092	< 0.083	< 0.086
Tetrahydrothiophene	110-01-0	88.17	< 0.082	< 0.092	< 0.083	< 0.086
Bromothiophene	1003-09-4	163.04	< 0.082	< 0.092	< 0.083	< 0.086
Thiophenol	108-98-5	110.18	< 0.082	< 0.092	< 0.083	< 0.086
Diethyl Disulfide	110-81-6	122.3	< 0.082	< 0.092	< 0.083	< 0.086
Total Unidentified Sulfur		34.08	< 0.082	< 0.092	< 0.083	< 0.086
Total Reduced Sulfurs		34.08	< 0.082	< 0.092	< 0.083	< 0.086
All unidentified compound's concentrations expressed in terms of H_2S (TRS does not include COS and SO_2)						
Speciated Sulfur Compounds Emission Rates (lb/hr)						
		MW				
Hydrogen Sulfide		34.08	< 0.011	< 0.011	< 0.010	< 0.011
Carbonyl Sulfide / Sulfur Dioxide[1]		64.07	0.127	0.140	0.159	0.142
Methyl Mercaptan		48.11	< 0.015	< 0.016	< 0.015	< 0.015
Ethyl Mercaptan		62.13	< 0.020	< 0.020	< 0.019	< 0.020
Dimethyl Sulfide		62.13	< 0.020	< 0.020	< 0.019	< 0.020
Carbon Disulfide		76.13	< 0.024	< 0.025	< 0.023	< 0.024
Isopropyl Mercaptan		76.16	< 0.024	< 0.025	< 0.023	< 0.024
tert-Butyl Mercaptan		90.18	< 0.028	< 0.030	< 0.027	< 0.028
n-Propyl Mercaptan		76.16	< 0.024	< 0.025	< 0.023	< 0.024
Methylethylsulfide		76.16	< 0.024	< 0.025	< 0.023	< 0.024
sec-Butyl Mercaptan / Thiophene[1]		90.19	< 0.028	< 0.030	< 0.027	< 0.028
iso-Butyl Mercaptan		90.19	< 0.028	< 0.030	< 0.027	< 0.028
Diethyl Sulfide		90.19	< 0.028	< 0.030	< 0.027	< 0.028
n-Butyl Mercaptan		90.19	< 0.028	< 0.030	< 0.027	< 0.028
Dimethyl Disulfide		94.2	< 0.030	< 0.031	< 0.029	< 0.030
2-Methylthiophene		98.17	< 0.031	< 0.032	< 0.030	< 0.031
3-Methylthiophene		98.17	< 0.031	< 0.032	< 0.030	< 0.031
Tetrahydrothiophene		88.17	< 0.028	< 0.029	< 0.027	< 0.028
Bromothiophene		163.04	< 0.051	< 0.053	< 0.049	< 0.051
Thiophenol		110.18	< 0.035	< 0.036	< 0.033	< 0.035
Diethyl Disulfide		122.3	< 0.038	< 0.040	< 0.037	< 0.039
Total Unidentified Sulfur		34.08	< 0.011	< 0.011	< 0.010	< 0.011
Total Reduced Sulfurs		34.08	< 0.011	< 0.011	< 0.010	< 0.011

1: lb/hr calculated assuming concentration is entirely analyte with larger MW

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1. Introduction

Chase Young Environmental Testing Inc (CYET) was retained by Crimson Holdings, LLC (Crimson Holdings) [SRN: E8117] to conduct emission testing at the EU-Spray Dryer exhaust stack at their facility located in Adrian, Michigan. The purpose of the emissions test program was to measure filterable and condensable particulate matter emission rates at the EU-Spray Dyer exhaust. Testing for this project was completed April 4th, 2023, and was performed in accordance with CYET project number 221643 Emission Test Plan.

The following CYET professionals participated in the completion of this compliance test program: Matthew Young, Senior Project Manager; and Brandon Chase, Senior Environmental Engineer. Mr. Stephen Letson, Production Specialist with Crimson Holdings, provided on-site coordination and collected process data for this test program.

Testing of the source consisted of triplicate 96-minute test runs for total particulate matter. Sampling was performed utilizing United States Environmental Protection Agency (USEPA) Methods 5 and 202. The results of the emissions test program are summarized in the following Table 1.

1.a Identification, Location, and Dates of Test

Testing for this project was completed April 4th, 2023 at the Crimson Holdings facility located in Adrian, MI. Testing of the EU-Spray Dryer consisted of triplicate 96-minute test runs for total particulate matter.

1.b Purpose of Testing

The purpose of testing was to verify that PM emission rates from EU-Spray Dryer are in compliance PTI No. 38-06. This permit limits emissions as summarized by Table 2.

Table 2
Reporting Units and Emission Limits

Unit ID/ Source Name	Parameter	Reporting Units	Emission Limit	Emission Limit Reference
EU-Spray Dryer	PM	lbs/1000 lbs of exhaust gases	0.03	PTI NO. 38-06
EU-Spray Dryer	PM-10	lbs/hr	10.2	PTI NO. 38-06

1.c Source Description

This facility operates under PTI No. 38-06 issued February 9, 2006. This permit consists of EU-Spray Dryer, described in the PTI as a milk spray drying operation consisting of a drying