**VERMONT AGENCY OF NATURAL RESOURCES**
**Department of Environmental Conservation**
**Air Quality & Climate Division**

# TECHNICAL SUPPORT DOCUMENT FOR A TITLE V PERMIT TO CONSTRUCT AND OPERATE

**#AOP-14-009**
**DEC# RU98-0179**

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SOURCE: Cheese Manufacturing
Agri-Mark, Inc.
869 Exchange Street
Middlebury, Vermont

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## I. INTRODUCTION

Agri-Mark, Inc. (referred to herein as "Owner/Operator" or “Permittee”) owns and operates a cheese manufacturing plant (also referred to herein as "Facility") in Middlebury, Vermont. The Facility produces cheddar cheese for the national retail market. The Facility currently operates boilers for space and process heat. Other potential emission sources include emergency diesel-powered generators, whey dryers and a cooling tower.

Agri-Mark has proposed to replace two (2) existing 600 horsepower No. 6 fuel oil boilers with three (3) new 600 horsepower natural gas fired boilers that will utilize Ultra Low Sulfur Diesel (ULSD) as a back-up fuel.

Agri-Mark has requested approval to continue to fire No. 6 fuel oil with 1% maximum sulfur content until the summer of 2015. At that time, the Facility intends to clean the No. 6 fuel tank and utilize it for ULSD.

Depending on logistics of construction of the Vermont Gas pipeline, the phase-in date of ULSD may change. Consequently, no deadline for the ULSD fuel conversion has been established. The Permittee intends to burn natural gas as its primary fuel. ULSD will serve as backup fuel when natural gas is curtailed or cannot meet demand.

The Facility includes the following air pollution related operations, equipment and emission control devices outlined in Table 1-1 below:

**Table 1-1: Equipment Specifications**

| Equipment/Make/Model | Capacity/Size MMBtu/hr[1] (H.P.)[2] | Fuel Type | Date of Installation | Control Device |
|---|---|---|---|---|
| Two (2) Nebraska Boilers | 27 (600) | No. 6 fuel oil | 1974 | None |
| Three (3) Cleaver-Brooks Boilers | 23.7 (600) | Natural Gas / No. 2 fuel oil[3] | Proposed 2015 | None |
| Maxon NP-1 Whey[4] Protein Concentrate Dryer | 8 | Propane / Natural Gas | 2001 | Cyclone pre-collectors and fabric filters |
| Bagging operation[6] | - | - | | Fabric filters |
| Maxon NP-1 Whey Permeate Dryer[4,5] | 12 | Propane / Natural Gas | 2001 | Cyclone precollector with, wet scrubber system and demister; fabric filters |
| fluidized bed dryer (steam heated) | - | | | |
| Bagging operation[6] | - | - | | Fabric filters |
| Evapco Cooling Tower | 1,200 gpm | n/a | 2001 | Mist eliminator |
| **Unit/Make/Model** | **Capacity Bhp[7] (kW)[8]** | **Fuel Type** | **Date of Installation** | **Control Device** |
| John Deere Model JD | 170 (126) | ULSD | 1994 | None |

| | | | | |
|---|---|---|---|---|
| 6068TF001 Emergency Generator[9] | | | | |
| Cummins 6BT-5.9 Emergency Generator | 166 (100) | ULSD | 1998 | None |
| Cummins 250 DFBE Emergency Generator | 390 (250) | ULSD | 1995 | None |

[1] MMBtu/hr - Million British Thermal Units per hour maximum rated heat input.
[2] H.P. – Boiler horsepower rated output;
[3] New boilers will combust No. 2 fuel oil with a maximum of 0.05% sulfur only during periods of natural gas curtailment from the time of installation until July 2018, when the requirements for maximum sulfur content become 0.0015%;
[4] Single dryer/burner with two parallel collectors followed by identical baghouses.
[5] Permeate dryer consists of drying chamber heated by Maxon NP-1 burner followed by fluid bed heated with indirect steam.
[6] Bagging operation refers to packaging dried whey products into totes or bags. Bagging operations are equipped with dust control but vent indoors.
[7] bhp – brake horsepower rated output as specified by the manufacturer.
[8] kW – kilo Watt electrical output.
[9] John Deer generator serves as back up to wastewater system lift pumps in the event of a power outage.

The Facility's allowable air contaminant emissions are outlined below in Table 1-2:

| **Table 1-2: Air Contaminant Emissions (tons/year)[1]** | | | | | |
|---|---|---|---|---|---|
| **$PM/PM_{10}$** | **$SO_2$** | **$NO_x$** | **CO** | **VOCs** | **HAPs[2]** |
| 63.7 | 174[3] | 66 | 21.4 | 1.4 | <10/25 |

[1] $PM/PM_{10}$ - particulate matter and particulate matter of 10 micrometers in size or smaller; $SO_2$ - sulfur dioxide; $NO_x$ - oxides of nitrogen measured as $NO_2$ equivalent; CO - carbon monoxide; VOCs - volatile organic compounds; HAPs - hazardous air pollutants as defined in §112 of the federal Clean Air Act.
[2] Emissions of individual HAPs each < 10 tpy and emissions of total HAPs combined <25 tpy. Actual total combined HAPs estimated at <1 tpy.
[3] The Facility is anticipated to drop out of Title V once the No.6 oil boilers are removed, or 2018 at the latest when the 0.5% sulfur No.6 oil limits take effect.

## II. FACILITY LOCATION AND DESCRIPTION

### A. Facility Location

Agri-Mark, Inc. owns and operates the cheese plant located at 869 Exchange Street in Middlebury, Vermont. The area surrounding the Facility is primarily industrial. The closest residences to the facility are greater than one half kilometer away. The Facility is located next to Otter Creek Brewery and across the street from Sun Fitness Center. The Facility is located 97 kilometers from the Lye Brook Wilderness area in Manchester, Vermont and greater than 100 kilometer from the Great Gulf and Dry River Wilderness areas in New Hampshire.

### B. Facility Description

The Facility is a cheese manufacturer listed under the Standard Industrial Classification ("SIC") Code #2022, production of natural, processed or imitation cheese.

**Boilers:** Agri-Mark, Inc. currently operates two Nebraska boilers for space and process heat. The boilers burn No. 6 fuel oil and each unit has an estimated heat input of approximately 27 MMBtu/hr. Both boilers were installed in 1974. The Permittee has proposed to install three new Cleaver-Brooks boilers rated at 23.7 MMBtu/hr each. The boilers will burn natural gas with No. 2 back-up. Approximately 90% of the steam demand at the facility is for process heat, so seasonal variation in fuel consumption is minimal. Currently, the boilers exhaust through a common stack that is 115 feet above grade and 48 inches in diameter. Upon installation of the three new boilers, the common stack will be demolished and three separate stacks, one for each boiler, will be constructed at 43 feet above the finished grade. Operation of the boilers results in the emission of sulfur dioxide ("$SO_2$"), nitrogen oxides ("$NO_x$"), carbon monoxide ("CO"), particulate matter ("PM"), volatile organic compounds ("VOCs") and hazardous air pollutants ("HAPs") to the ambient air.

**Whey Vacuum Filtration System:** The Whey Vacuum Filtration System is used to store, transfer and package the finished whey product. A portion of the liquid fraction from the filter system is transferred to the Whey Permeate Evaporator System. Emissions from the Whey Vacuum Filtration System are controlled by a fabric filter. As the Whey Vacuum Filtration System discharges inside the building, it is not a source of ambient air contaminants.

**Whey Permeate Evaporator System:** The Whey Permeate Evaporator System concentrates the permeate before drying. The Whey Permeate Evaporator System is located after the whey filtration system and before the Whey Dryers.

**Whey Dryers:** The two whey dryers are rated at 8 MMBtu/hr and 12 MMBtu/hr maximum heat input. The whey dryers have approval to burn either propane or natural gas. The 8 MMBtu/hr whey dryer spray dries whey protein concentrate ("WPC"). Emissions from this dryer are controlled by cyclones and fabric filters. The 12 MMBtu/hr whey dryer is used to spray dry whey permeate. Following the spray dryer, the permeate drying is completed in a fluidized bed. The emissions from the permeate dryer are controlled by cyclones followed by a wet venturi-style scrubber system and a demister. The fluidized bed emissions are controlled by fabric filters. Emissions from the whey dryers include both products of combustion and whey particulates. Products of combustion include $NO_x$, CO, and VOCs. Whey particulate emissions would be classified as particulate matter less than 10 microns in diameter ("$PM_{10}$").

**Whey Permeate Evaporator System:** The Whey Permeate Evaporator System concentrates the permeate before drying. The vapors are condensed and used for process water within the Facility. There is no discharge to atmosphere from this system. The Whey Permeate Evaporator System is located after the whey filtration system and before the whey permeate dryer.

**Evapco Cooling Tower:** The flow rate of the Evapco cooling tower is 1,200 gallons per minute. Although the cooling tower emits particulate matter, calculations demonstrate that the emissions are negligible.

**Cheese Production:** The process begins with the heating (pasteurization) of raw milk to kill any harmful bacteria. Following pasteurization, the milk is pumped to a coagulation tank, mixed with rennin, and cooked at approximately 100 $^{o}$F. During coagulation the milk solids begin to separate from the liquid portion, which is also known as the whey. Both the pasteurization and coagulation tanks are heated using steam from the boilers.

After coagulation, the cheese is chopped into curds and salted. The whey is removed by vacuum in a packing tower. The packed cheese is then cut into 40-pound blocks, shrink wrapped, and packaged for shipping.

**Whey Concentration Processes:** The whey is removed from the cheese and passed through a whey separator to remove butter fat. The whey is then processed through the ultra filtration system to separate the protein and permeate. The whey protein stream is dried in the 8 MMBtu/hr whey dryer. The whey permeate stream is condensed in the evaporator and then dried in the 12 MMBtu/hr whey permeate dryer.

### C. Description of Compliance Monitoring Devices

The Facility currently operates “broken bag detectors” on all fabric filters to monitor compliance. The broken bag detectors are designed to alert the operator of potential exceedances of the particulate emission limit by an audible or visual alarm.

## III. FEDERAL APPLICABLE REQUIREMENTS

**40 *CFR* Part 64 - Compliance Assurance Monitoring.** Pursuant to requirements concerning enhanced monitoring and compliance certification under the *Clean Air Act* ("*CAA*"), EPA promulgated new regulations and revised regulations on October 22, 1997. These new requirements implemented compliance assurance monitoring ("CAM") for major stationary sources of air pollution that are required to obtain operating permits under Title V of the *CAA*. Subject to certain exemptions, the new regulations require owners or operators of such sources to conduct monitoring that satisfies particular criteria established in the rule to provide a reasonable assurance of compliance with applicable requirements under the *CAA*. Monitoring is proposed to focus on emissions units that rely on pollution control device equipment to achieve compliance with applicable standards. The regulations also provide procedures for coordinating these new requirements with the operating permits program regulations.

Section 64.2 of 40 *C.F.R*. specifies that each pollutant specific emission unit at a facility that meets a three-part test is subject to the requirements for CAM. An emission unit must:

(1) Be subject to an emission limit or standard;
(2) Use a control device to achieve compliance;
(3) Have **pre-control** emissions that exceed or are equivalent to the major source threshold in 40 *CFR* Part 70 (i.e., 10 tpy individual HAP, 25 tpy total HAP, 50 tpy VOCs, or 100 tpy for any other air contaminant).

Equipment at the Facility that meets the first criteria are the boilers and the exhausts for the two whey dryers. As the boilers do not use control devices (criteria #2), they are not subject to CAM. The cyclones and baghouses collecting product from the whey dryers are not considered pollution control devices as they are inherent process equipment that collect product (40 *CFR* §64.1). The wet scrubber on the whey permeate line does meet the first two criteria, consequently the pre-control emissions from the wet scrubber have been calculated for comparison to the third criteria. As stated in the 16 November 2001 Agri-Mark Trip Report from C.E. Rogers Company, the dry solids flow rate to the wet scrubber are between 17 and 18.8 lbs/hr. This results in 82 tpy of particulate entering the wet scrubber [(18.8 lb/hr) x (8760 hr/yr) / (2000 lb/ton)], which is less than the major source threshold for particulates of 100 tpy.

As none of the equipment at the Facility meets the three criteria listed above, the Facility is currently not subject to CAM.

**40 *CFR* Part 68 - Chemical Accident Prevention Provisions (*CAA* 112(r): Risk Management Plan).** Pursuant to 40 *CFR* §68.215, Facilities storing quantities of chemicals greater than threshold amounts are required to file a Risk Management Plan with the EPA. Agri-Mark, Inc. has filed such a plan for storage of anhydrous ammonia at the Middlebury facility.

## IV. QUANTIFICATION OF POLLUTANTS

The quantification of emissions from a stationary source is necessary in order to establish the regulatory designation of the Facility and proposed modification, and consequently determine the level of review that is required under the *Regulations*. The designation of a stationary source is determined by its allowable emissions. Allowable emissions are defined as "the emission rate calculated using the maximum rated capacity of the source and, if applicable, either: (a) the applicable emission standard contained in the *Regulations*, if any, or (b) the emission rate or design, operational or equipment standard specified in any order or agreement issued under these *Regulations* that is state and federally enforceable". This means that allowable emissions must be determined assuming continuous operation of the stationary source (i.e. 8760 hours per year) at maximum capacity, unless the owner/operator of the source operates under enforceable limits that restrict operation to a lower level. An applicant may impose in its application an emission rate or design, operational or equipment limitation on its operations to be incorporated into the permit to restrict the Facility's allowable emissions. Such limitations may include fuel restrictions such as a limit on sulfur content of the fuel below the regulation maximum allowable, a restriction on annual fuel usage, or a production limit such as a cap on the amount of product to be produced on which the allowable emissions would be calculated.

Table 4-1 and Table 4-2 below outline the emissions based on No. 6 fuel oil and natural gas, respectively.

The Facility has one Facility wide Btu cap 401,440 MMBtu/yr that includes 330,000 MMBtu from fuel oil based on the existing fuel oil cap of 2,200,000 gallons of No.6 and 71,440 MMBtu from propane used in the whey dryers. Therefore, the calculations of emissions from the boilers are based on just the 330,000 MMBtu. Emission calculations for both natural gas and fuel oil were performed on the whole Btu cap to determine the worst case on a pollutant by pollutant basis.

**Table 4-1: Oil Scenario, No. 6 Oil – Allowable Emissions**

| Fuel oil limit = 330,000 MMBtu/yr | Emission Factor | | | Allowable Emissions, tons/yr |
|---|---|---|---|---|
| | **Factor** | **Units** | **Source** | |
| $PM/PM_{10}$ | 0.18 | lb/MMBtu | AP-42 Table 1.3-1 (5/10) | 29.7 |
| $SO_2$ | 1.05 | | | 173.3 |
| $NO_x$ | 0.37 | | | 61.1 |
| CO | 0.033 | | | 5.4 |
| NMTOCs | 0.0019 | | | 0.31 |

| Table 4-2: Natural Gas Scenario – Allowable Emissions | | | | |
|---|---|---|---|---|
| Fuel oil limit = 330,000 MMBtu/yr | Emission Factor | | | Allowable Emissions, tons/yr |
| | Factor | Units | Source | |
| $PM/PM_{10}$ | 0.0075 | lb/MMBtu | AP-42 Table 1.4-1 and 1.4-2 (7/98) | 1.2 |
| $SO_2$ | 0.0006 | | | 0.1 |
| $NO_x$ | 0.098 | | | 16.2 |
| CO | 0.082 | | | 13.5 |
| NMTOCs | 0.0054 | | | 0.9 |

Table 4-3 below outlines the estimated emissions from the Facility's emergency engines.

| Table 4-3: Emergency Engines – Allowable Emissions | | | | |
|---|---|---|---|---|
| Emergency Generators (3):<br>170 hp John Deere<br>166 hp Cummins<br>390 hp Cummins<br>Estimated 200 hrs per year<br>Max Capacity: (726 hp) x 200 hrs/yr = 145,200 hp-hr per year. | Factor | Units | Source | Allowable Emissions |
| | | | | tons per year |
| $SO_2$ | $2.05 \times 10^{-3}$ | lb/ hp-hr | AP-42 Table 3.3-1 (10/96) | 0.15 |
| $NO_x$ | $3.1 \times 10^{-2}$ | | | 2.25 |
| PM | $2.2 \times 10^{-3}$ | | | 0.16 |
| CO | $6.68 \times 10^{-3}$ | | | 0.48 |
| VOC | $2.5 \times 10^{-3}$ | | | 0.18 |
| HAPs | $4.52 \times 10^{-5}$ | | | <0.1 |

<u>Evapco Cooling Tower</u>

- 1,200 gal/min design flowrate
- Maximum solids content of water (0.125 ppm) is based on an original mineral content of 5000 ppm that has been treated by reverse osmosis (RO) twice. The RO is at least 99.5% efficient (e.g., 5000ppm x $(1-0.995)^2$ squared term due to running through RO twice).
- Emissions are estimated using AP-42 factor of 0.019 pounds of $PM_{10}$ drift per thousand gallons of cooling water (AP-42, Table 13.4-1).

$PM_{10}$ Emissions = $1{,}200\ ^{gal}/_{min} \times 60\ ^{min}/_{hr} \times 8{,}760\ ^{hr}/_{yr} \times (1.9 \times 10^{-5}\ ^{lb\ drift}/_{gal}) \times 1.25 \times 10^{-7}\ ^{lb\ solids}/_{lb\ drift}$

= 0.0015 pounds per year

= Negligible

Whey Protein Concentrate Dryer and Permeate Dryer Fabric Filters (EP-8, EP-9, EP-10, EP-11, EP-12)

- Potential air contaminants from propane combustion: $NO_2$, CO, $SO_2$ and VOC. Whey paticulates are a source of $PM_{10}$ emissions.
- Sulfur content of propane (S): 10 gr/100 cf.
- MSER for dried whey powder emissions is 0.01 gr/dscf (Note: This calculation quantifies all the PM emissions from both the Whey Protein Concentrate and the Whey Permeate Dryers, except for the Whey Permeate Wet Scrubber and the Dryer)

$$34{,}600 \text{ dscfm} \times 0.01 \text{ gr/dscf} \times 7.14 \times 10^{-8} \ {}^{ton}/_{gr} \times 525{,}600 \ {}^{min}/_{year} = 13 {}^{tons}/_{year}$$

**Table 4-4: Whey Protein Concentrate Dryer – Allowable Emissions**

| Whey Protein Concentrate Dryer: 8 MMBtu/hr Propane Fired burner Max Capacity:64 gallons per hour (560,640 gallons propane per year) | Emission Factor | | | Allowable Emissions |
|---|---|---|---|---|
| | Factor | Units | Source | tons per year |
| $SO_2$ | 0.1S | lb/1000 gal | AP-42 Table 1.5-1 (10/96) | 0.3 |
| $NO_x$ | 4.5 | lb/1000 gal | mfg. data | 1.3 |
| PM | 0.01 | gr/dscf | MSER | 13 |
| CO | 12.6 | lb/1000 gal | mfg. data | 3.5 |
| VOC | 0.5 | lb/1000 gal | AP-42 Table 1.5-1 (10/96) | 0.14 |

Permeate Dryer Wet Scrubber (EP-13)

- Potential air contaminants from propane combustion: $NO_2$, CO, $SO_2$ and VOC. Whey paticulates are a source of $PM_{10}$ emissions.
- Sulfur content of propane (S): 10 gr/100 cf.
- MSER for the wet scrubber on the permeate dryer is 0.02 gr/dscf.

$$28{,}000 \text{ dscfm} \times 0.02 \text{ gr/dscf} \times 7.14 \times 10^{-8} \ {}^{ton}/_{gr} \times 525{,}600 \ {}^{min}/_{year} = 21 {}^{tons}/_{year}$$

**Table 4-5: Whey Permeate Dryer – Allowable Emissions**

| Whey Permeate Dryer: 12 MMBtu/hr Propane Fired burner Max Capacity:71 gallons per hour (621,960 gallons propane per year) | Emission Factor | | | Allowable Emissions |
|---|---|---|---|---|
| | Factor | Units | Source | tons per year |
| $SO_2$ | 0.1S | lb/1000 gal | AP-42 Table 1.5-1 (10/96) | 0.3 |
| $NO_x$ | 4.5 | lb/1000 gal | mfg. data | 1.4 |
| PM | 0.022 | gr/dscf | MSER | 21 |
| CO | 12.6 | lb/1000 gal | mfg. data | 3.9 |
| VOC | 0.5 | lb/1000 gal | AP-42 Table 1.5-1 (10/96) | 0.16 |

Allowable emission totals are outlined in Table 4-6 below.

| Table 4-6: Summary of Future Allowable Emissions by Source (tons/year) | | | | | |
|---|---|---|---|---|---|
| Source | $PM/PM_{10}$ | $SO_2$ | $NO_x$ | CO | VOC |
| Facility Boilers (Maximum Emissions) | 29.7 | 173.3 | 61.1 | 13.5 | 0.9 |
| Emergency Engine Generators | 0.16 | 0.15 | 2.25 | 0.48 | 0.18 |
| Evapco Cooling Tower | <0.1 | - | - | - | - |
| Whey Protiein Concentrate Dryer | 13 | 0.3 | 1.3 | 3.5 | 0.14 |
| Whey Permeate Dryer | 21 | 0.3 | 1.4 | 3.9 | 0.16 |
| **Facility Totals** | **63.68** | **174.05** | **66.05** | **21.38** | **1.38** |