AP42 Section: 9.5.3 **Meat Rendering Plants**

Title: **Comments and correspondence to 1995 supplement A**

Note: This material is related to a section in *AP42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the file number, the AP42 chapter and then the section. The file name "rel01_c01s02.pdf" would mean the file relates to AP42 chapter 1 section 2. The document may be out of date and related to a previous version of the section. The document has been saved for archival and historical purposes. The primary source should always be checked. If current related information is available, it will be posted on the AP42 webpage with the current version of the section.

HUGUS ASSOCIATES
consultants in personnel management
226 West Jefferson Boulevard-Suite 517-South Bend, Indiana-46601
Phone (219) 232-2828

August 28, 1996

FACSIMILE 919-541-0684

TO: DALLAS SAFARIET

FROM: DAVID FOSTER

Subject: Emission Factors / Meat Rendering Plants and
Pet Food Plants

Dear Dallas:

I am searching for information on the subject processes. If you have or are aware of any sources for emission factors, please advise. Thank you. Your help will be most appreciated.

Sincerely,

David Foster
Senior Management Consultant
Fax/ 219-232-2897
E-mail/ Dfoster854@aol.com

9/4/96

Sent copy of attached "memo to file" by fax on 9/4/96. Called Foster to discuss his request - warned strongly about use of e.f. from 1 facility.

FAS Talked with
Rech-ow 3-3-98
will send new
test reports with
of summaries without
CBI. I will
ask CBI office
to return reports
to her.

February 13, 1998

Mr. Dave Meirhenry
Air Quality Compliance Section
Nebraska Department of Environmental Quality
P. O. Box 98922
Lincoln, NE 68509-8922

RE: IBP, inc., Lexington, Nebraska
Blood Drying System VOC Test Report

Dear Mr. Meirhenry:

Please find enclosed a copy of the VOC Test Report for the IBP, inc., Lexington facility. The testing was conducted on September 2, 1997, by TRC Environmental Corporation. Volatile organic carbon testing was completed per the Nebraska Compliance Sampling Methods and was approved through protocol submittals. As shown in the detailed testing report on page 3, the average VOC (Total Hydrocarbons as Methane) emission rate from the natural gas fired blood dryers is 0.360 lbs/hr as methane. Some information submitted within this test report is stamped confidential due to the process data contained and should be kept as such.

If you have any questions concerning the testing results or procedures used, please contact me at 402-241-3647 or you may contact Mr. Scott Miller, TRC Project Manager, at 630-810-1122.

Sincerely,

Rechelle Kruse
Air Pollution Control Engineer

Enclosure

c: Leo Lang (without test report)
Bruce George (with test report)
Thomas Lapp (with test report)

RK98-437/LE-Stack Tests

Project Summary:

IBP created a project to quantify VOC emissions from their rendering processes including blood dryers, edible dryers, and inedible cookers for both beef and pork. The testing was conducted on all three systems under various heating conditions. The intent was to quantify VOC emissions for natural gas system as well as steam systems and to prove or disprove the difference in VOC's from products developed in fuel fired vs. steam heated processes.

The Lexington testing was completed on a beef steam blood dryer. The facility has only one Stord blood dryer.

Emission Data:

Blood Steam Dryer:

Test Data:

Test #1	0.494 lbs/hr
Test #2	0.287 lbs/hr
Test #3	0.297 lbs/hr
Average	0.360 lbs/hr

Process Information During Test:

Head Kill	4,645 hd/day
Blood Yield	7.79 lbs/hd finished
Blood Operation hours	20

dly 6-515

Total Blood Processed:
[(4,645 heads/day) x (7.79 lbs/hd)] / 20 hrs/day = 1,809.23 lbs/hr finished blood
(1,809.23 lbs/hr) x (1 ton/2,000 lbs) = 0.90 tons/hr

Blood Emission Factor:

Blood Processed	0.90 tons/hr
VOC Emissions from Blood Drying	0.36 lbs/hr

(0.36 lbs/hr) / 0.90 tons/hr = 0.40 lbs/ton finished blood ibp®

October 22, 1996

Mr. Thomas W. Lapp
Midwest Research Institute
Suite 350
401 Harrison Oaks Blvd.
Cary, NC 27513-2412

RE: AP-42 Meat Rendering Section

Dear Mr. Lapp:

We offer the following comments for your consideration regarding the proposed AP-42 section for meat rendering plants.

1. Figure 9.5.3-5 should acknowledge the potential for PM emissions starting with the cooker condenser exhaust and continuing through each emission point on the schematic. PM emissions at these points typically consist of entrained fat particles along with some product.

2. We consider the statement made in Section 9.5.3.3 that "VOCs are the primary air pollutants emitted from rendering operations" to be questionable. This is an unsubstantiated statement. Any discussion regarding VOCs from a rendering process should be qualified by stating that VOC emissions are possible, but not quantified.

3. We question the inclusion of hydrogen sulfide and ammonia numbers in Table 9.5.3-2. Emissions of these substances is directly related to the age of the blood being rendered. We suggest that these two parameters be handled in the same manner as VOC emissions, i.e. acknowledged as potential but not qualified.

We appreciate the opportunity to review and comment on this document. If you have any questions regarding this, please contact me at 402-241-2036.

Very truly yours,

Kim Dirks

Kim Dirks
Environmental Engineer
Permits & Compliance

KD:ml

KD96-1534

IBP, inc. P.O. BOX 515, DAKOTA CITY, NEBRASKA 68731 TELEPHONE: 402-494-2061

MRI

MIDWEST RESEARCH INSTITUTE
Suite 350
401 Harrison Oaks Boulevard
Cary, North Carolina 27513-2412
Telephone (919) 677-0249
FAX (919) 677-0065

September 20, 1996

Mr. Kim Dirks
IBP, Inc.
Mail Drop 130
Highway 35
Dakota City, Nebraska 68731

Dear Kim:

Thank you very much for your conversation yesterday with David Bullock regarding the AP-42 sections on meat rendering plants and meat packing plants. I have enclosed a copy of the background report, AP-42 section, and Appendices for the current Section 9.5.3, Meat Rendering Plants. We have no specific deadline for the revision of the existing section but would like to put a revised section on the TTN Bulletin Board as soon as it is convenient. If you could briefly look over the document and call me, we can decide on a timeframe that is convenient for your schedule. During development of the enclosed report, a review draft was sent to Don Franco at the National Renders Association; he, in turn, sent it to W.H. Prokop for review and comment. Due to a miscommunication, a review copy was not sent to the American Meat Institute for their review and comment.

I will contact the American Meat Institute (AMI) and inform them that we are starting to develop an AP-42 section for meat packing plants and that we have contacted you for assistance. We assume that AMI would be the most appropriate trade association. If you do not think that a contact with AMI is appropriate, please call me and we can discuss.

Thank you very much for your assistance with the revision of the rendering section and the development of the meat packing section. We realize that you have a busy schedule and we will try very hard not to impose on that schedule. We sincerely appreciate your input in order to make the AP-42 sections as accurate and usable as possible. At your convenience, please call me at (919) 677-0249, ext. 5258, or David Bullock at ext. 5350 to discuss a review time or any comments you may have.

Sincerely,

Tom

Thomas W. Lapp

Enclosure

MRI

MIDWEST RESEARCH INSTITUTE
Suite 350
401 Harrison Oaks Boulevard
Cary, North Carolina 27513-2412
Telephone (919) 677-0249
FAX (919) 677-0065

Date: March 25, 1993

Subject: Background Information for Proposed AP-42
Section 9.5.3, Meat Rendering Plants
Review and Update Remaining Sections of Chapter 9
(Food and Agriculture) of AP-42
EPA Contract 68-D2-0159, Work Assignment 08
MRI Project 4601

From: Brian Shrager

To: Dallas Safriet
EPA/EIB/EFMS (MD-14)
U. S. Environmental Protection Agency
Research Triangle Park, NC 27711

I. INTRODUCTION

This memorandum presents the background information that was used to develop the proposed AP-42 Section 9.5.3 on meat rendering plants. A description of the industry is presented first. A process description followed by a discussion of emissions and controls are then presented. Finally, the reference list is provided. The draft AP-42 section is provided as the attachment.

II. INDUSTRY DESCRIPTION[1]

Rendering plants process animal by-product materials for the production of tallow, grease, high-protein meat and bone meal, and glue. Plants that operate in conjunction with animal slaughterhouses or poultry processing plants are called integrated rendering plants. Plants that collect their raw materials from a variety of offsite sources are called independent rendering plants. Independent plants obtain animal by-product materials, including grease, blood, feathers, offal, and entire animal carcasses, from the following sources: butcher shops, supermarkets, restaurants, fast-food chains, poultry processors, slaughterhouses, farms, ranches, feedlots, and animal shelters.

The two types of animal rendering processes are edible and inedible rendering. Edible rendering plants process fatty animal tissue into edible fats and proteins. The plants are normally operated in conjunction with meat packing plants under U. S. Department of Agriculture, Food Safety and Inspection Services (USDA/FSIS) inspection and processing standards. Inedible rendering plants are operated by independent renderers to produce inedible tallow and grease, which are used in livestock and poultry feed, soap, and production of fatty-acids. The source category code (SCC) for animal/poultry rendering is 3-02-038-01.

Since the early 1980's, the number of independent rendering plants has significantly declined because less raw material is available due to changes in the meat packing industry. Also, a downward trend in tallow and grease prices has contributed to the declining number of plants. In

1992, an estimated 150 independent rendering plants and 100 integrated plants were operating in the United States.

III. PROCESS DESCRIPTION

A. Edible Rendering

A typical edible rendering process is shown in Figure 1. Fat trimmings, usually consisting of 14 to 16 percent fat, 60 to 64 percent moisture, and 22 to 24 percent protein, are ground and then belt conveyed to a melt tank. The melt tank heats the materials to about 43°C (110°F), and the melted fatty tissue is pumped to a disintegrator, which ruptures the fat cells. The proteinaceous solids are separated from the melted fat and water by a centrifuge. The melted fat and water are then heated with steam to about 93°C (200°F) by a shell and tube heat exchanger. A second-stage centrifuge then separates the edible fat from the water, which also contains any remaining protein fines. The water is discharged as sludge, and the "polished" fat is pumped to storage. Throughout the process, direct heat contact with the edible fat is minimal.

B. Inedible Rendering

There are two processes for inedible rendering: the wet process and the dry process. Wet rendering is a process that separates fat from raw material by boiling in water. The process involves addition of water to the raw material and the use of live steam to cook the raw material and accomplish separation of the fat. Dry rendering is a batch or continuous process that dehydrates raw material in order to release fat. Following dehydration in batch or continuous cookers, the melted fat and protein solids are separated. At present, only dry rendering is used in the United States. The wet rendering process is no longer used because of the high cost of energy and of an adverse effect on the fat quality. The following describes each stage in the dry rendering process.

1. Raw Materials. Integrated rendering plants normally process only one type of raw material, whereas independent rendering plants often handle several raw materials that require either multiple rendering systems or significant modifications in the operating conditions for a single system. Table 1 shows the fat, protein, and moisture contents for several raw materials processed by inedible rendering plants.

2. Batch Rendering Process. Figure 2 shows the basic inedible rendering process using multiple batch cookers. In the batch process, the raw material from the receiving bin is screw conveyed to a crusher where it is reduced to 2.5 to 5 centimeters (cm) (1 to 2 inches [in.]) in size to improve cooking efficiency. Cooking normally requires 1.5 to 2.5 hr, but adjustments in the cooking time and temperature may be required to process the various materials. A typical batch cooker is a horizontal, cylindrical vessel equipped with a steam jacket and an agitator. To begin the cooking process, the cooker is charged with raw material and the material is heated to a final temperature ranging from 121° to 135°C (250° to 275°F). Following the cooking cycle, the contents are discharged to the percolator drain pan.

The percolator drain pan contains a screen that separates the liquid fat from the protein solids. From the percolator drain pan, the protein solids, which still contain about 25 percent fat, are conveyed to the screw press. The screw press completes the separation of fat from solids, and yields protein solids that have a residual fat content of about 10 percent. These solids, called cracklings, are then screened and ground to produce protein meal. The fat from both the screw press and the

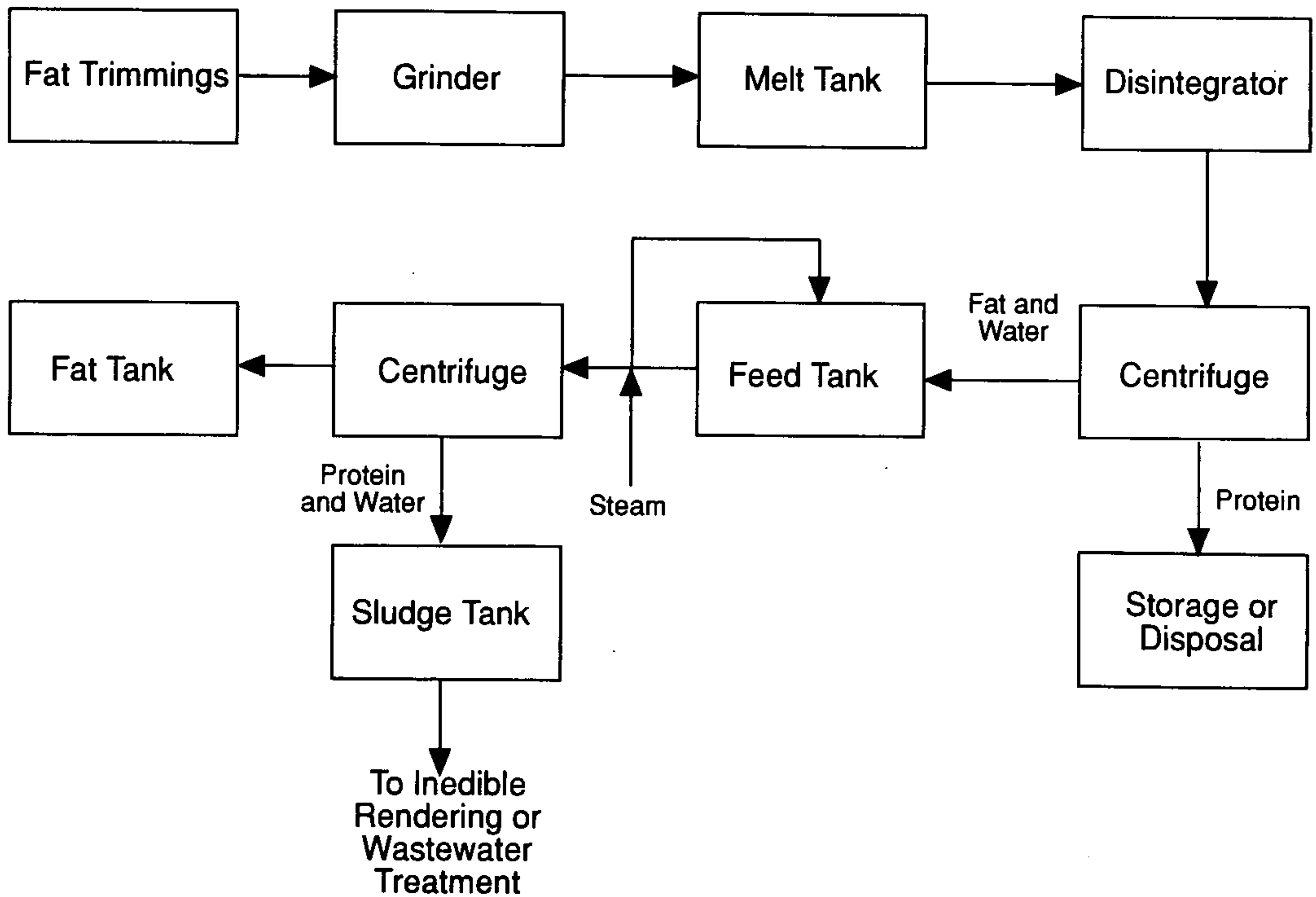

Figure 1. Edible rendering system.

TABLE 1. COMPOSITION OF RAW MATERIALS FOR INEDIBLE RENDERING[1]

Source	Tallow/grease, Wt %	Protein solids, Wt %	Moisture, Wt %
Packing house offal[a] and bone			
Steers	30-35	15-20	45-55
Cows	10-20	20-30	50-70
Calves	10-15	15-20	65-75
Sheep	25-30	20-25	45-55
Hogs	25-30	10-15	55-65
Dead stock (whole animals)			
Cattle	12	25	63
Calves	10	22	68
Sheep	22	25	53
Hogs	30	28	42
Butcher shop fat and bone	31	32	37
Blood	None	16-18	82-84
Restaurant grease	65	10	25
Poultry offal	10	25	65
Poultry feathers	None	33	67

[a]Waste parts; especially the entrails and similar parts from a butchered animal.

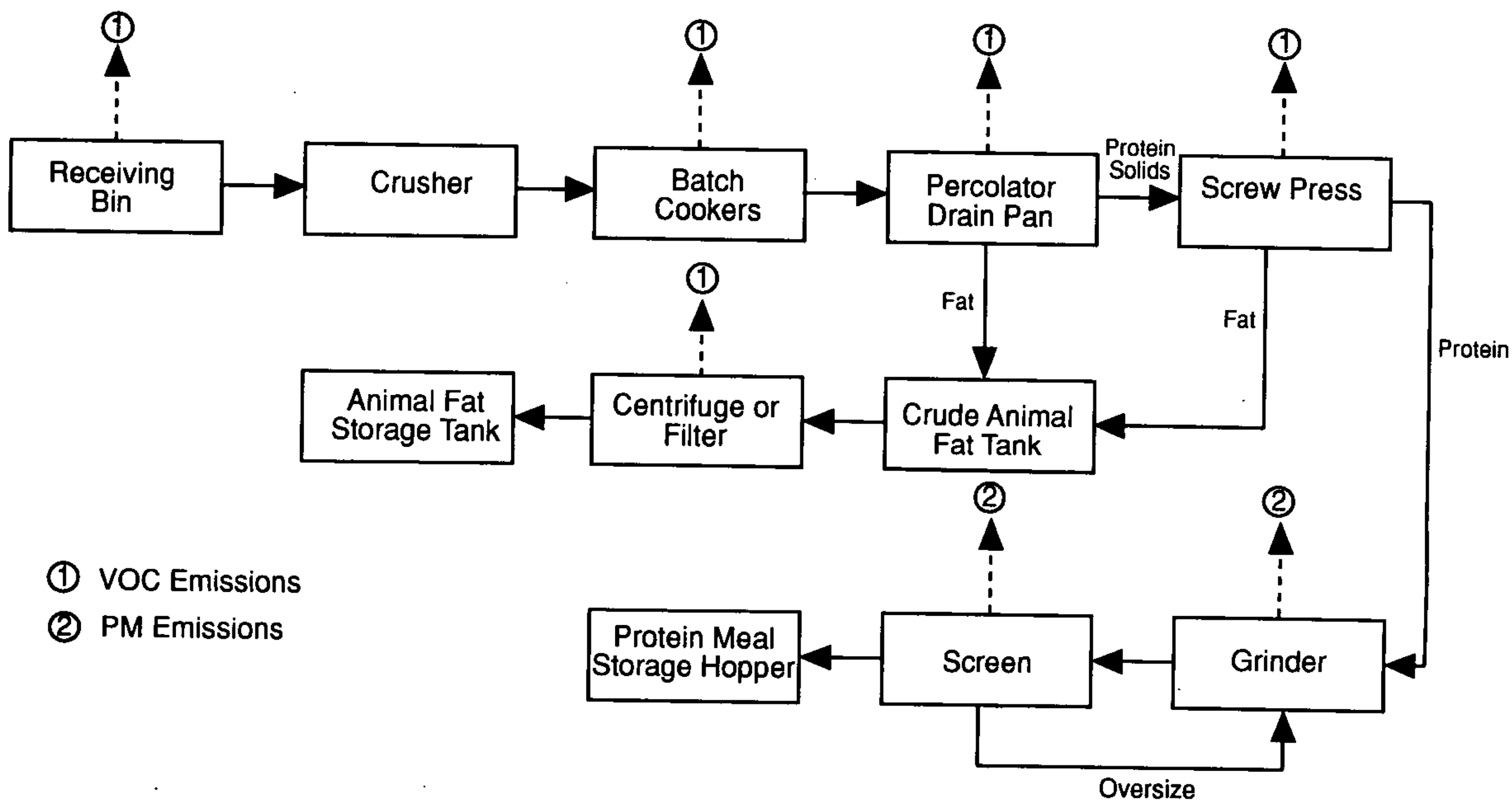

Figure 2. Batch cooker rendering process.

percolator drain pan is pumped to the crude animal fat tank, centrifuged or filtered to remove any remaining protein solids, and stored in the animal fat storage tank.

3. Continuous Rendering Process. Since the 1960's, continuous rendering systems have been installed to replace batch systems at some plants. A typical continuous rendering process is shown in Figure 3. The system is similar to a batch system except that a single, continuous cooker is used rather than several parallel batch cookers. A typical continuous cooker is a horizontal, steam-jacketed cylindrical vessel equipped with a mechanism that continuously moves the material horizontally through the cooker. Continuous cookers cook the material faster than batch cookers, and typically produce a higher quality fat product. From the cooker, the material is discharged to the drainer, which serves the same function as the percolator drain pan in the batch process. The remaining operations are generally the same as the batch process operations.

4. Blood Processing and Drying. Whole blood from animal slaughterhouses, containing 16 to 18 percent total protein solids, is processed and dried to recover protein as blood meal. The blood meal is a valuable ingredient in animal feed because it has a high lysine content.

Continuous cookers have replaced batch cookers that were originally used in the industry because of the improved energy efficiency and product quality provided by continuous cookers. In the continuous process, whole blood is introduced into a steam-injected, inclined tubular vessel in which the blood solids coagulate. The coagulated blood solids and liquid (serum water) are then separated in a centrifuge, and the blood solids dried in either a continuous gas-fired, direct-contact ring dryer or a steam tube, rotary dryer.

5. Poultry Feathers and Hog Hair Processing. The raw material is introduced into a batch cooker with water, and is processed for 30 to 45 min. at temperatures ranging from 138° to 149°C (280° to 300°F) and pressures ranging from (40 to 50 psig). This process converts keratin, the principal component of feathers and hog hair, into amino acids.

6. Grease Processing. Grease from restaurants is recycled as another feed material processed by rendering plants. The grease is bulk loaded into vehicles, transported to the rendering plant, and discharged directly to the grease processing system.

During processing, the melted grease is first screened to remove coarse solids, and then heated to about 93°C (200°F) in vertical processing tanks. The material is then stored in the processing tank for 36 to 48 hr to allow for gravity separation of the grease, water, and fine solids. Separation normally results in four phases: (1) solids, (2) water, (3) emulsion layer, and (4) grease product. The solids settle to the bottom and are separated from the water layer above. The emulsion is then processed through a centrifuge to remove solids and another centrifuge to remove water and any remaining fines. The grease product is skimmed off the top.

IV. EMISSIONS

Volatile organic compounds (VOC's) are the primary air pollutants emitted from rendering operations. The major constituents that have been identified as potential emissions include organic sulfides, disulfides, C-4 to C-7 aldehydes, trimethylamine, C-4 amines, quinoline, dimethyl pyrazine, other pyrazines, and C-3 to C-6 organic acids. In addition, lesser amounts of C-4 to C-7 alcohols, ketones, aliphatic hydrocarbons, and aromatic compounds are potentially emitted. Historically, the VOC's are considered an odor nuisance in residential areas in close proximity to rendering plants, and

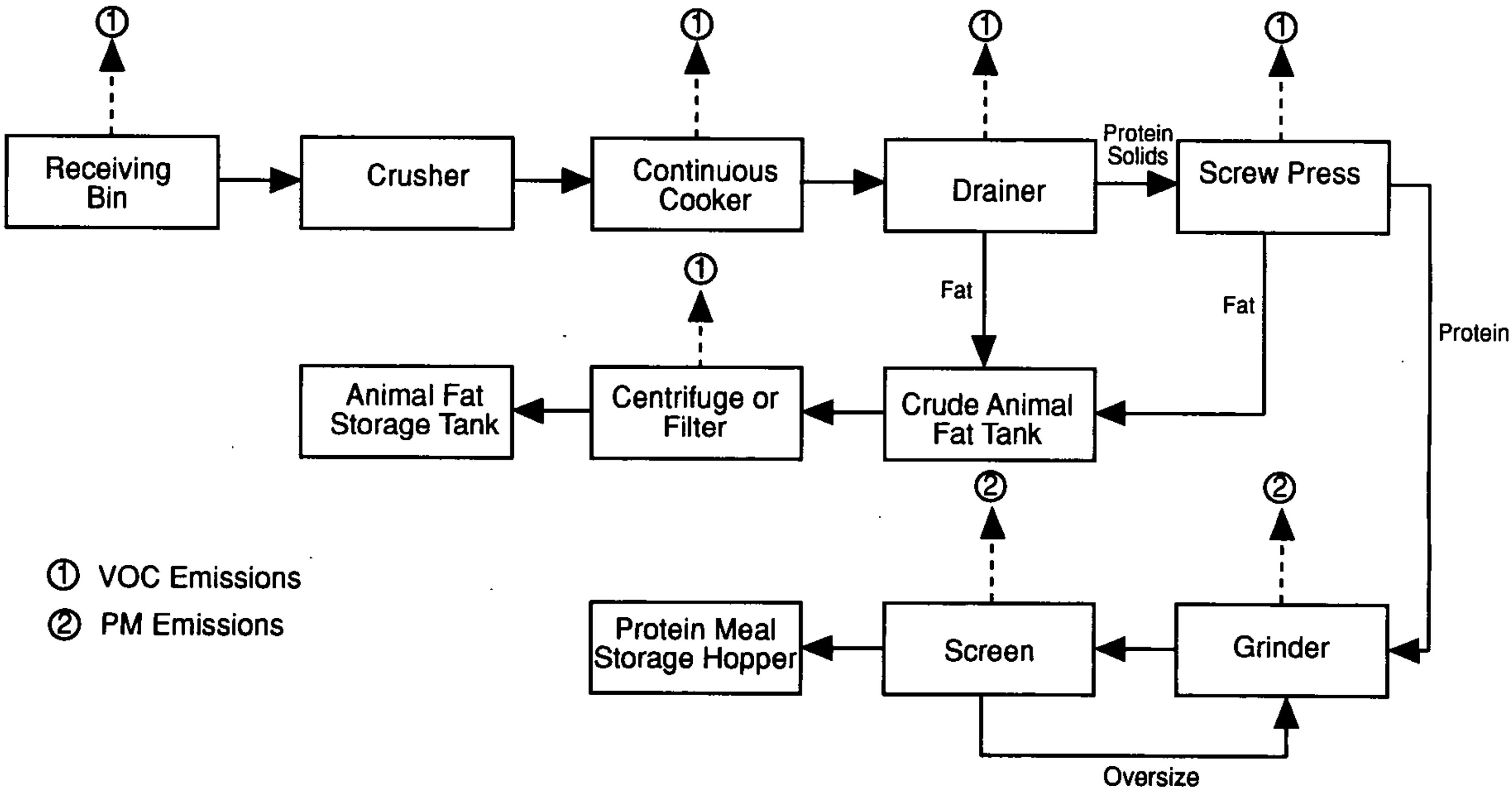

Figure 3. Continuous rendering process.

emission controls are directed toward odor elimination. Of the specific constituents listed, only quinoline is classified as a hazardous air pollutant (HAP).

Emissions from the edible rendering process are not considered to be significant because no cooking vapors are emitted and direct heat contact with the edible fat is minimal. Therefore, these emissions are not discussed further.

For inedible rendering operations, the primary sources of VOC emissions are the cookers and the screw press. Other sources of VOC emissions include blood and feather processing operations, dryers, centrifuges, tallow processing tanks, and percolator pans that are not enclosed. Raw material may also be a source of VOC emissions, but if the material is processed in a timely manner, these emissions are minimal.

In addition to VOC emissions, particulate matter (PM) is emitted from certain rendering operations such as dryers processing blood and feathers. No emission data quantifying VOC, HAP, or PM emissions from rendering plants are available for use in developing emission factors.

V. EMISSION CONTROL TECHNOLOGY

Emission control at rendering plants is based on the elimination of odor. The control technologies that are typically used for rendering plant process emissions are waste heat boilers (incinerators) and multistage wet scrubbers. Boiler incinerators are the most common control technology because boilers are used to generate steam for cooking and drying operations, and the same boilers can be used as control devices. Multistage wet scrubbers are used when incinerators are not practical. Plants that are located near residential or commercial areas may treat process and fugitive emissions by ducting the plant ventilation air through a wet scrubbing system to minimize odorous emissions. In addition to the conventional scrubber control technology, activated carbon adsorption and catalytic oxidation are used to control odor. Recently, some plants have installed biofilters to control emissions.

In waste heat boilers, the waste stream can be introduced into the boiler as primary or secondary combustion air. Primary combustion air is mixed with fuel before ignition to allow for complete combustion, and secondary combustion air is mixed with the burner flame to complete combustion. Gaseous waste streams that contain noncondensibles are typically "cleaned" in a combination scrubber and entrainment separator before use as combustion air.

Multistage wet scrubbers using various scrubbing agents are the primary alternative to incinerators. Sodium hypochlorite is considered to be the most effective scrubbing agent for odor removal, although other oxidants can be used. Recently, chlorine dioxide has been used as an effective scrubbing agent. Venturi scrubbers are often used to remove PM from waste streams before treatment by the multistage wet scrubbers because large particles tend to deplete the oxidizing agent used in the multistage scrubbing system. A typical multistage wet scrubber system consists of a venturi scrubber followed by one or two packed bed scrubbers.

Wet scrubbing of plant ventilation air is an effective means of controlling odor emissions. In these systems, vents from the buildings that house the various processes are ducted to a single scrubber, usually a packed bed scrubber using sodium hypochlorite as the scrubbing agent. When used in conjunction with multistage wet scrubbers controlling process emissions, these systems may provide up to 99 percent control of odor emissions.

VI. REFERENCES

1. P.E. Prokop, "Rendering Plants," in Chapter 13, Food and Agriculture Industry, Air Pollution Engineering Manual, Van Nostrand Reinhold Press, 1992.

DRAFT AP-42 SECTION 9.5.3

9.5.3 MEAT RENDERING PLANTS

9.5.3.1 General

Meat rendering plants process animal by-product materials for the production of tallow, grease, high-protein meat and bone meal, and glue. Plants that operate in conjunction with animal slaughterhouses or poultry processing plants are called integrated rendering plants. Plants that collect their raw materials from a variety of offsite sources are called independent rendering plants. Independent plants obtain animal by-product materials, including grease, blood, feathers, offal, and entire animal carcasses, from the following sources: butcher shops, supermarkets, restaurants, fast-food chains, poultry processors, slaughterhouses, farms, ranches, feedlots, and animal shelters.

The two types of animal rendering processes are edible and inedible rendering. Edible rendering plants process fatty animal tissue into edible fats and proteins. The plants are normally operated in conjunction with meat packing plants under U. S. Department of Agriculture, Food Safety and Inspection Services (USDA/FSIS) inspection and processing standards. Inedible rendering plants are operated by independent renderers to produce inedible tallow and grease, which are used in livestock and poultry feed, soap, and production of fatty-acids. The source category code (SCC) for animal/poultry rendering is 3-02-038-01.

9.5.3.2 Process Description

Edible Rendering

A typical edible rendering process is shown in Figure 9.5.3-1. Fat trimmings, usually consisting of 14 to 16 percent fat, 60 to 64 percent moisture, and 22 to 24 percent protein, are ground and then belt conveyed to a melt tank. The melt tank heats the materials to about 43°C (110°F), and the melted fatty tissue is pumped to a disintegrator, which ruptures the fat cells. The proteinaceous solids are separated from the melted fat and water by a centrifuge. The melted fat and water are then heated with steam to about 93°C (200°F) by a shell and tube heat exchanger. A second-stage centrifuge then separates the edible fat from the water, which also contains any remaining protein fines. The water is discharged as sludge, and the "polished" fat is pumped to storage. Throughout the process, direct heat contact with the edible fat is minimal.

Inedible Rendering

There are two processes for inedible rendering: the wet process and the dry process. Wet rendering is a process that separates fat from raw material by boiling in water. The process involves addition of water to the raw material and the use of live steam to cook the raw material and accomplish separation of the fat. Dry rendering is a batch or continuous process that dehydrates raw material in order to release fat. Following dehydration in batch or continuous cookers, the melted fat and protein solids are separated. At present, only dry rendering is used in the United States. The wet rendering process is no longer used because of the high cost of energy and of an adverse effect on the fat quality. The following describes each stage in the dry rendering process.

Raw Materials. Integrated rendering plants normally process only one type of raw material, whereas independent rendering plants often handle several raw materials that require either multiple rendering systems or significant modifications in the operating conditions for a single system.

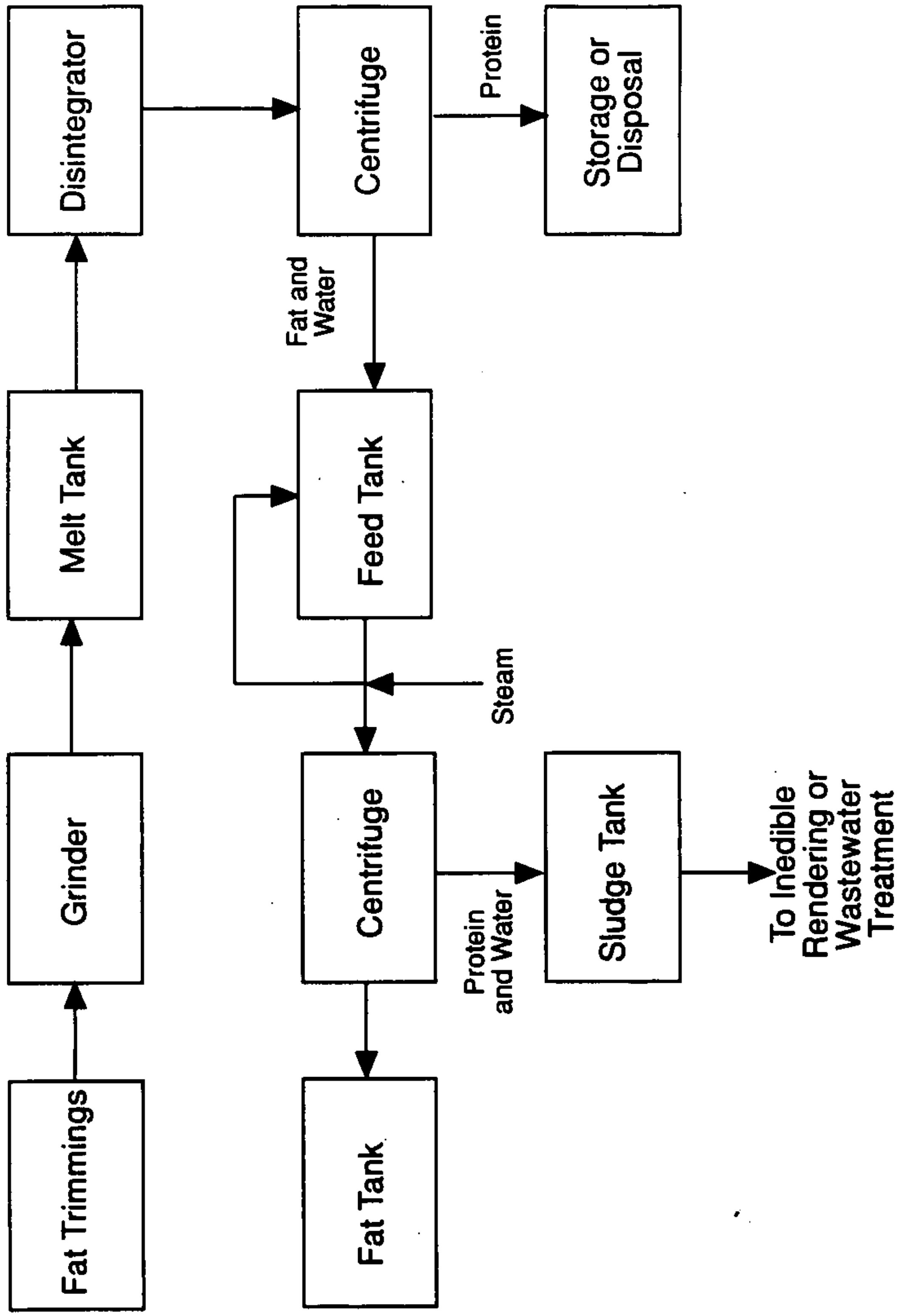

Figure 9.5.3-1. Edible rendering system.

Table 9.5.3-1 shows the fat, protein, and moisture contents for several raw materials processed by inedible rendering plants.

Batch Rendering Process. Figure 9.5.3-2 shows the basic inedible rendering process using multiple batch cookers. In the batch process, the raw material from the receiving bin is screw conveyed to a crusher where it is reduced to 2.5 to 5 centimeters (cm) (1 to 2 inches [in.]) in size to improve cooking efficiency. Cooking normally requires 1.5 to 2.5 hr, but adjustments in the cooking time and temperature may be required to process the various materials. A typical batch cooker is a horizontal, cylindrical vessel equipped with a steam jacket and an agitator. To begin the cooking process the cooker is charged with raw material, and the material is heated to a final temperature ranging from 121° to 135°C (250° to 275°F). Following the cooking cycle, the contents are discharged to the percolator drain pan.

The percolator drain pan contains a screen that separates the liquid fat from the protein solids. From the percolator drain pan, the protein solids, which still contain about 25 percent fat, are conveyed to the screw press. The screw press completes the separation of fat from solids, and yields protein solids that have a residual fat content of about 10 percent. These solids, called cracklings, are then screened and ground to produce protein meal. The fat from both the screw press and the percolator drain pan is pumped to the crude animal fat tank, centrifuged or filtered to remove any remaining protein solids, and stored in the animal fat storage tank.

Continuous Rendering Process. Since the 1960's, continuous rendering systems have been installed to replace batch systems at some plants. A typical continuous rendering process is shown in Figure 9.5.3-3. The system is similar to a batch system except that a single, continuous cooker is used rather than several parallel batch cookers. A typical continuous cooker is a horizontal, steam-jacketed cylindrical vessel equipped with a mechanism that continuously moves the material horizontally through the cooker. Continuous cookers cook the material faster than batch cookers, and typically produce a higher quality fat product. From the cooker, the material is discharged to the drainer, which serves the same function as the percolator drain pan in the batch process. The remaining operations are generally the same as the batch process operations.

Blood Processing and Drying. Whole blood from animal slaughterhouses, containing 16 to 18 percent total protein solids, is processed and dried to recover protein as blood meal. The blood meal is a valuable ingredient in animal feed because it has a high lysine content.

Continuous cookers have replaced batch cookers that were originally used in the industry because of the improved energy efficiency and product quality provided by continuous cookers. In the continuous process, whole blood is introduced into a steam-injected, inclined tubular vessel in which the blood solids coagulate. The coagulated blood solids and liquid (serum water) are then separated in a centrifuge, and the blood solids dried in either a continuous gas-fired, direct-contact ring dryer or a steam tube, rotary dryer.

Poultry Feathers and Hog Hair Processing. The raw material is introduced into a batch cooker with water, and is processed for 30 to 45 min. at temperatures ranging from 138° to 149°C (280° to 300°F) and pressures ranging from (40 to 50 psig). This process converts keratin, the principal component of feathers and hog hair, into amino acids.

Grease Processing. Grease from restaurants is recycled as another feed material processed by rendering plants. The grease is bulk loaded into vehicles, transported to the rendering plant, and discharged directly to the grease processing system.

Table 9.5.3-1. COMPOSITION OF RAW MATERIALS FOR INEDIBLE RENDERING[1]

Source	Tallow/grease, Wt %	Protein solids, Wt %	Moisture, Wt %
Packing house offal[a] and bone			
Steers	30-35	15-20	45-55
Cows	10-20	20-30	50-70
Calves	10-15	15-20	65-75
Sheep	25-30	20-25	45-55
Hogs	25-30	10-15	55-65
Dead stock (whole animals)			
Cattle	12	25	63
Calves	10	22	68
Sheep	22	25	53
Hogs	30	28	42
Butcher shop fat and bone	31	32	37
Blood	None	16-18	82-84
Restaurant grease	65	10	25
Poultry offal	10	25	65
Poultry feathers	None	33	67

[a]Waste parts; especially the entrails and similar parts from a butchered animal.

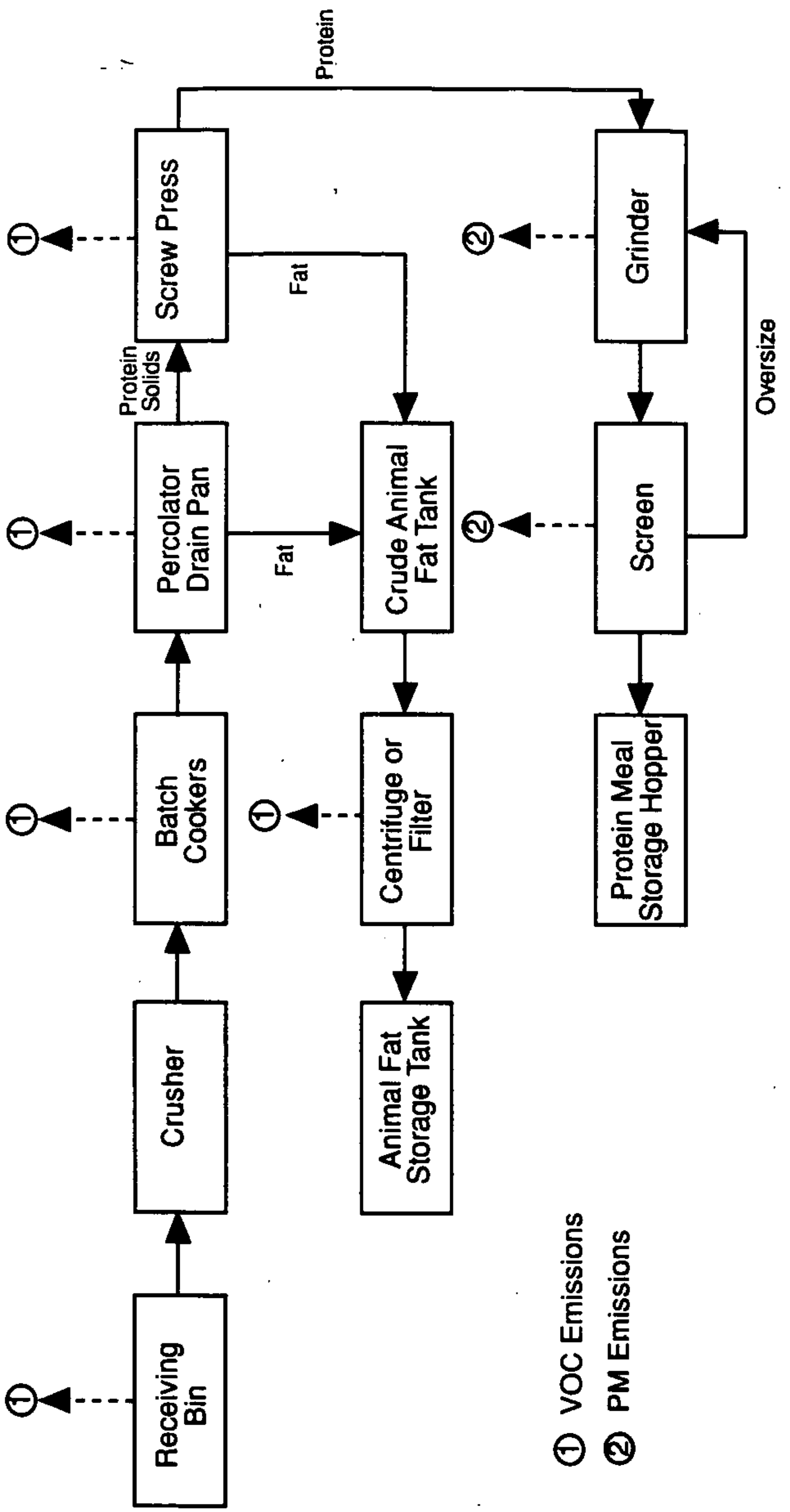

Figure 9.5.3-2. Batch cooker rendering process.

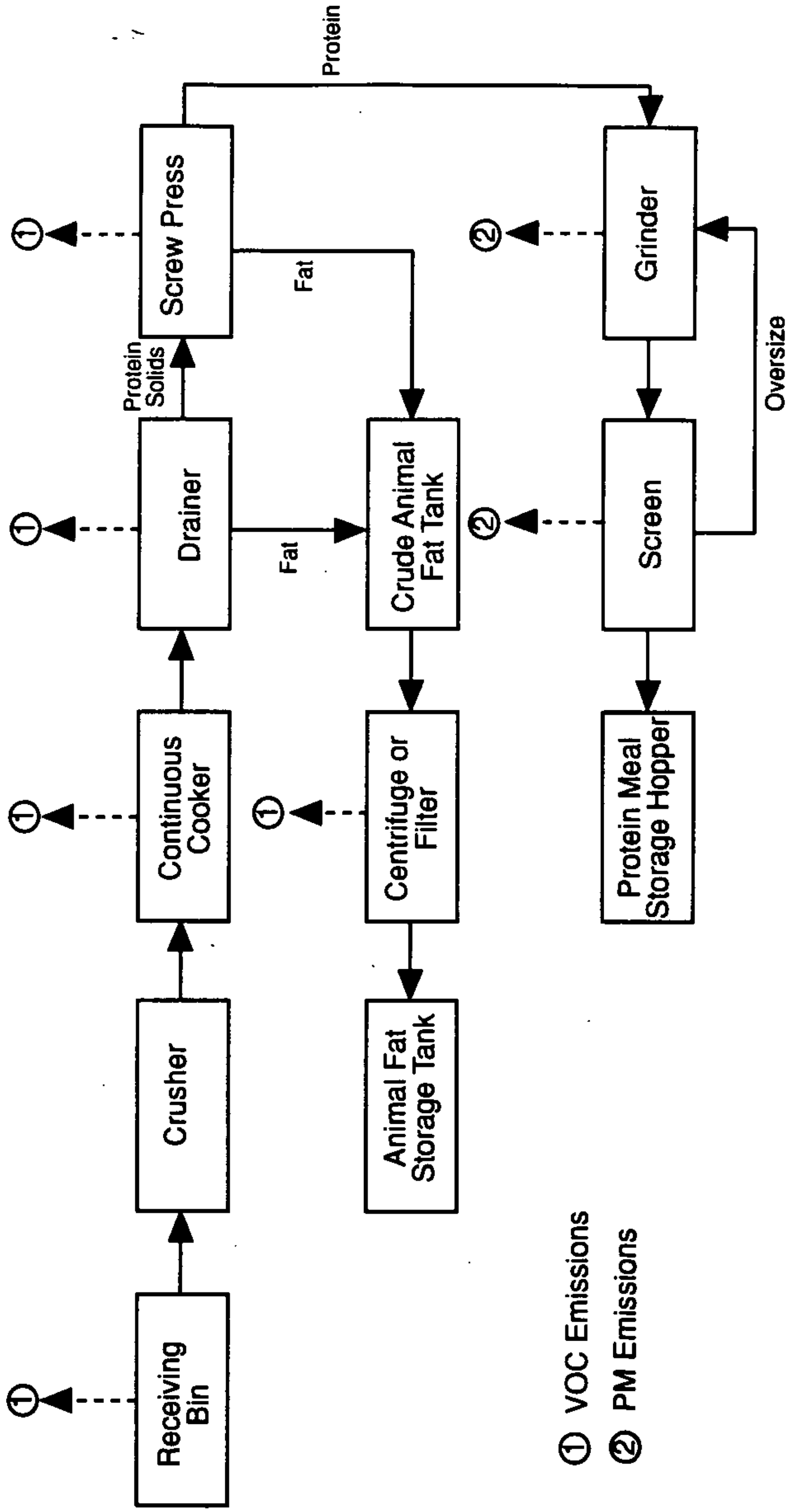

Figure 9.5.3-3. Continuous rendering process.

During processing, the melted grease is first screened to remove coarse solids, and then heated to about 93°C (200°F) in vertical processing tanks. The material is then stored in the processing tank for 36 to 48 hr to allow for gravity separation of the grease, water, and fine solids. Separation normally results in four phases: (1) solids, (2) water, (3) emulsion layer, and (4) grease product. The solids settle to the bottom and are separated from the water layer above. The emulsion is then processed through a centrifuge to remove solids and another centrifuge to remove water and any remaining fines. The grease product is skimmed off the top.

9.5.3.3 Emissions and Controls

Volatile organic compounds (VOC's) are the primary air pollutants emitted from rendering operations. The major constituents that have been identified as potential emissions include organic sulfides, disulfides, C-4 to C-7 aldehydes, trimethylamine, C-4 amines, quinoline, dimethyl pyrazine, other pyrazines, and C-3 to C-6 organic acids. In addition, lesser amounts of C-4 to C-7 alcohols, ketones, aliphatic hydrocarbons, and aromatic compounds are potentially emitted. Historically, the VOC's are considered an odor nuisance in residential areas in close proximity to rendering plants, and emission controls are directed toward odor elimination. Of the specific constituents listed, only quinoline is classified as a hazardous air pollutant (HAP).

Emissions from the edible rendering process are not considered to be significant because no cooking vapors are emitted and direct heat contact with the edible fat is minimal. Therefore, these emissions are not discussed further.

For inedible rendering operations, the primary sources of VOC emissions are the cookers and the screw press. Other sources of VOC emissions include blood and feather processing operations, dryers, centrifuges, tallow processing tanks, and percolator pans that are not enclosed. Raw material may also be a source of VOC emissions, but if the material is processed in a timely manner, these emissions are minimal.

In addition to VOC emissions, particulate matter (PM) is emitted from certain rendering operations such as dryers processing blood and feathers. No emission data quantifying VOC, HAP, or PM emissions from rendering plants are available for use in developing emission factors.

Emission control at rendering plants is based on the elimination of odor. The control technologies that are typically used for rendering plant process emissions are waste heat boilers (incinerators) and multistage wet scrubbers. Boiler incinerators are the most common control technology because boilers are used to generate steam for cooking and drying operations, and the same boilers can be used as control devices. Multistage wet scrubbers are used when incinerators are not practical. Plants that are located near residential or commercial areas may treat process and fugitive emissions by ducting the plant ventilation air through a wet scrubbing system to minimize odorous emissions. In addition to the conventional scrubber control technology, activated carbon adsorption and catalytic oxidation are used to control odor. Recently, some plants have installed biofilters to control emissions.

In waste heat boilers, the waste stream can be introduced into the boiler as primary or secondary combustion air. Primary combustion air is mixed with fuel before ignition to allow for complete combustion, and secondary combustion air is mixed with the burner flame to complete combustion. Gaseous waste streams that contain noncondensibles are typically "cleaned" in a combination scrubber and entrainment separator before use as combustion air.

Multistage wet scrubbers using various scrubbing agents are the primary alternative to incinerators. Sodium hypochlorite is considered to be the most effective scrubbing agent for odor removal, although other oxidants can be used. Recently, chlorine dioxide has been used as an effective scrubbing agent. Venturi scrubbers are often used to remove PM from waste streams before treatment by the multistage wet scrubbers because large particles tend to deplete the oxidizing agent used in the multistage scrubbing system. A typical multistage wet scrubber system consists of a venturi scrubber followed by one or two packed bed scrubbers.

Wet scrubbing of plant ventilation air is an effective means of controlling odor emissions. In these systems, vents from the buildings that house the various processes are ducted to a single scrubber, usually a packed bed scrubber using sodium hypochlorite as the scrubbing agent. When used in conjunction with multistage wet scrubbers controlling process emissions, these systems may provide up to 99 percent control of odor emissions.

References for Section 9.5.3

1. P.E. Prokop, "Rendering Plants," in Chapter 13, Food and Agriculture Industry, Air Pollution Engineering Manual, Van Nostrand Reinhold Press, 1992.

MIDWEST RESEARCH INSTITUTE
Suite 350
401 Harrison Oaks Blvd.
Cary, N.C. 27513
Telephone (919) 677-0249
Fax (919) 677-0065

FAX TRANSMISSION

TO: David Foster

FROM: Tom Lapp Ext. 5258

TIME: 11:40 Am

DATE: 9/4/96

THIS FAX CONSISTS OF 3 PAGES (INCLUDING THIS PAGE)

RECEIVING FAX NUMBER: 219/232-2897

COMMENTS: Per Telephone Discussion.

INTEROFFICE MEMORANDUM

MIDWEST RESEARCH INSTITUTE

April 3, 1996

To: AP-42 Section 9.5.3, Meat Rendering Plants, Project File

From: Tom Lapp

Subject: Review Of Emission Test Report From A Meat Rendering Plant

The Source Test Information Retrieval System (STIRS) data base identified one source test report for Section 9.5.3, Meat Rendering Plants, from the Indiana Packers Company, Delphi, Indiana. The pertinent information from this report and average emission factors calculated from the data are presented in this memorandum. This rendering plant is used to render pork fat and skin and to cook blood and hair. According to the test report, the emissions from the rendering and cooking vessels are passed through a venturi scrubber and then combined with a total building ventilation air stream. This combined stream is passed through a series of packed column scrubbers and then exhausted to the atmosphere. The permit writer for this facility was contacted and he stated that the room air was combined with the cooker exhaust prior to the venturi scrubber.

The pollutants of interest for this test were PM (front half and back half), ammonia, hydrogen sulfide, ethylamine, and VOC. In the back half PM analysis, the organic and inorganic fractions were separated. Test methods used for each pollutant are as follows:

PM--EPA Method 5 (modified with extra impinger)
NH_3--Ion-specific electrode (Method 5 impinger solutions)
H_2S--EPA Method 11
Ethylamine--EPA Method 18
VOC--EPA Method 25

The VOC data were not used to calculate emission factors because the emission levels from the facility were out of compliance.

Although processing data were presented for both the meat cooker and the blood drier, the reported emissions data were based only on the data for the meat cooker. No data were presented for emissions from the blood drier.

The average emission factors developed from the test data are as follows:

Pollutant	Average emission factor, lb/ton
Particulate--Total	1.5
--Filterable	0.39
--Condensible	
- Organic	1.1
- Inorganic	0.048
Ammonia	0.060
Hydrogen sulfide	2.3
Ethylamine	<0.07

The emission factors are based on lb per ton of fat processed.

4960\46030103

Date: August 26, 1994

To: Dallas Safriet, TSD/EIB MD-14
From: Tom Lapp, MRI

Subject: Test results for rendering operations

To date, only two test reports have been identified for emissions resulting from rendering operations. One of the test reports contained no process data so the results are not useful for calculation of emission factors. The other test report was for PM/PM10, hydrogen sulfide, and ammonia emissions from the blood dryer operation at the Milwaukee Tallow Co. The test was conducted on September 27, 1989. The results of this test are as follows (based on an average of 3 test runs):

Pollutant	Emission factors (Controlled) lbs/ton raw material	lbs/ton dried blood
PM/PM10	0.19	2.1
Hydrogen sulfide	0.007	0.08
Ammonia	0.05	0.6

All PM emissions were determined to be less than 10 microns in size.

The blood dryer is followed by an air/particulate cyclone to collect the dried blood meal product. After the cyclone, the control devices are a venturi wet scrubber followed by three packed bed scrubbers using sodium hypochlorite solution as the scrubbing medium.

↑ TEST DATE: Sept. 27, 1989 MILWAUKEE TALLOW Co. (#18)

D. Emission Data/Mass Flux Rates/Emission Factors BLOOD DRYER OPERATION

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
	Stack temperature	°F	64	65	65	
	Moisture	%	1.18	2.17	2.08	
	Oxygen	%	20.7	20.7	20.7	
	Volumetric flow, actual	acfm	71,627	71,455	71,366	
	Volumetric flow, standard	dscfm	69,581	68,553	68,527	
	Percent isokinetic		96.6	97.2	97.1	
Circle: Production or (feed rate) Capacity: ↓ 2275 lbs/hr each run - also is capacity		lbs/hr	26,300	26,300	26,300	
	Pollutant concentrations:					
	PM/~~PM10~~ - total	grams	0.0109	0.0117	0.0191	
	filterable PM-10	grams	0.0052	0.0065	0.0143	
	Condensible	grams	0.0057	0.0052	0.0048	
	Pollutant mass flux rates:					
	PM/PM10	gr/dscfm	0.003	0.004	0.006	
	Hydrogen Sulfide	mg/m³	<0.02	<0.01	1.04 ← overload	
	Ammonia	mg/m³	3.6	2.4	1.8	
	Emission factors: Rate					
	PM/PM10	lbs/hr	1.92	2.05	3.35	
	Hydrogen Sulfide	lbs/hr	<0.005	<0.003	0.266	
	Ammonia	lbs/hr	0.94	0.62	0.46	
	EMISSION FACTORS:	lbs/ton raw material				Ave.
	PM/PM10		0.146	0.156	0.255	0.19
	H_2S		● 0.0002	● 0.0001	0.020	● 0.007
	NH_3		0.071	0.047	0.035	0.051

	lbs/ton dried blood produced				
PM/PM10		1.69	1.80	2.94	2.1
H_2S		● 0.002	● 0.0015	0.234	● 0.08
NH_3		0.83	0.54	0.40	0.6

raw material
26,300 lbs = 13.15 Tons
dried blood product
2,275 lbs = 1.138 tons

Milwaukee Tallow

C. 1. List any APCD parameters (supplied in the test report) below.

APCD ID	Parameter	Units	Readings			
			Run 1	Run 2	Run 3	Run 4
Type of APCD:						
Type of APCD:						
Type of APCD:						

2. Include any additional information (such as capture techniques for fugitive systems) and descriptions of the air pollution control systems (use a separate page if necessary).

see attached sheets

Test Methods: No deviations from standard EPA testing procedures were noted.

PM EPA Method 5

PM10 6 stage in-stack Cascade impactor

H_2S EPA Method 11

NH_3 NIOSH Physical and Chemical Analytical Method (P&CAM) No. 125

All PM emissions were < 10μ in size

Unit is out of compliance for PM/PM10 but is OK for H_2S & NH_3

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	64	65	65	
BLOOD	Moisture	%	1.18	2.17	2.08	
DRYER	Oxygen	%	20.7	20.7	20.7	
	Volumetric flow, actual	acfm	71627	71455	71366	
	Volumetric flow, standard	dscfm	69580.65	68552.81	68527.41	
	Isokinetic variation	%	96.6	97.2	97.1	
Feed rate		TPH	13.15	13.15	13.15	
Production rate		TPH	1.138	1.138	1.138	
	Pollutant concentrations:					
	PM/PM-10	G/DSCF	0.0032707	0.0035424	0.0057886	
	Hydrogen Sulfide	mg/m^3	0.02	0.01	1.04	
	Ammonia	mg/m^3	3.6	2.4	1.8	
	Pollutant mass flux rates:					
	PM/PM-10	lb/hr	1.951	2.082	3.400	
	Hydrogen Sulfide	lb/hr	0.00522	0.00257	0.267	
	Ammonia	lb/hr	0.939	0.617	0.462	
	Emission factors: BASED ON RAW MATERIAL FEED					AVERAGE
	PM/PM-10	lb/ton	0.148	0.158	0.259	0.19
	Hydrogen Sulfide	lb/ton	0.000397	0.000195	0.0203	0.0070
	Ammonia	lb/ton	0.0714	0.0469	0.0352	0.051
	Emission factors: BASED ON DRIED BLOOD PRODUCED					AVERAGE
	PM/PM-10	lb/ton	1.71	1.83	2.99	2.2
	Hydrogen Sulfide	lb/ton	0.00458	0.00226	0.235	0.081
	Ammonia	lb/ton	0.825	0.542	0.406	0.59

MAR-24-1995 16:56 FROM EIB 919-541-0684 TO 96770065 P.01/01

FAX TRANSMITTAL # of pages ▶ 1

To Tom Lapp, Brian Schrager	From Ron Ryan
Dept./Agency MRI	Phone # 541-4330
Fax # 677-0065	Fax # 541-0684

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

From: RON RYAN
To: kleeman-jan
Date: 3/24/95 4:00pm

Please disregard my earlier transmission of the request reproduced below - I had not checked for the existence of the two numbers requested for Blood Dryers. I have changed the message below to request 3-02-038-11 and -12, instead of 3-02-038-02 and -03.

From: RON RYAN
To: RTP3.RTMU542.KLEEMAN-JAN
Date: 3/23/95 4:57pm
Subject: SCC request for MRI AP-42 sections

Please set up the following SCCs in AFS:

3-02-013-02	Batch Smokehouse - Smoking Cycle	1000 Lbs Sawdust Used
3-02-013-03	Batch Smokehouse - Cooking Cycle	1000 Lbs Product
3-02-013-04	Continuous Smokehouse - Smoke Zone	1000 Lbs Sawdust Used
3-02-013-05	Continuous Smokehouse - Heat Zone	1000 Lbs Product
3-02-038-11	Blood Dryer - Natural Gas Direct Fired	1000 Lbs Dried Blood Meal
3-02-038-12	Blood Dryer - Steam-coil Indirect Heated	1000 Lbs Dried Blood Meal

CC: dallas

Tom: Note change

CC: dallas

note this in a sentence in the AP-42 section.

TOTAL P.01

CONTACT REPORT--MRI Project No. 4603-01-03

From: Tom Lapp, Environmental Engineering Department

Date of Contact: April 3, 1996

Contacted by: Telephone

Company/Agency: Indiana Department of Environmental Management

Telephone Number: (317) 232-8470

Person(s) Contacted/Title(s)

Mr. Pat Powlen

CONTACT SUMMARY:

Mr. Powlen is the permit writer for the Indiana Packers Co. facility at Delphi, Indiana. Because the VOC emissions were out of compliance based on the test results, we wanted to know if any subsequent tests had been conducted. Mr. Powlen said no further testing had been done and that the plant actually was out of compliance on a technicality. The plant was trying to get the control system accepted by the state as BACT and that the state probably would agree.

He was asked why no data were presented for emissions from the blood drier; processing rate data for the blood drier were given in Appendix F of the test report along with the processing rate data for the meat cooker. Pat did not know the answer and suggested that we talk to Ed Surla. Pat has only the results of the test but not a copy of the complete test report.

Pat was asked about the configuration of the emissions vent from the cooker and the building ventilation air stream, where these two streams merged, and if the vent sampling occurred after the merger of the streams. Pat said the two streams are merged before the venturi scrubber; all of the control units are connected in tandem.

We discussed developing emission factors and other potential sources of data. Iowa Beef Packers (IBP) opened a facility in Logansport, Indiana last September but it has not had a compliance test as yet. Pat is also the permit person for that facility. He said that Kim Dirks in Dakota City, Nebraska is the IBP environmental contact for the facility in Logansport and that Dirks is very interested in seeing AP-42 emission factors for meat rendering plants. IBP has emission data for several of their plants as a result of in-house testing and Dirks may be agreeable to sharing this data. Dirks telephone number is (402) 241-2036. In addition, Pat thinks that the people at Indiana Packers would also be interested in assisting with the development of AP-42 emission factors. He suggested that we call Ed Nelson, Executive V.P., or Jim Lex at (317) 564-3680; Mr. Nelson is the first person to contact as he might be more agreeable.

CONTACT REPORT--MRI Project No. 4603-01-03

From: Tom Lapp, Environmental Engineering Department

Date of Contact: April 30, 1996

Contacted by: Telephone

Company/Agency: Indiana Dept. of Environmental Management
Office of Air Management

Telephone Number: (317) 232-8443

Person(s) Contacted/Title(s)

Mr. Ed Surla, Chief, Compliance Data Section

CONTACT SUMMARY:

Called Mr. Surla to obtain an explanation on why the process data for the blood drier was not used in any calculations in the test report. He could not find the file for Indiana Packers Company so we talked primarily from my copy of the test report. He did not specifically remember the test but we were able to discuss some of the test. According to Mr. Surla, the process data in Appendix F for both the meat cooker and the blood drier indicates that both processes were in operation during the test and the measured emissions were from both processes. However, the operating permit limits are based on tons of cooked fat and all calculations of lb of pollutant per ton processed would be based only on the tons of meat cooked. The emission rate would not include the processing rate for the blood drier even though the total emissions measured during the test are coming from both sources.

CONTACT REPORT--MRI Project No. 4603-01-03

From: Tom Lapp, Environmental Engineering Department

Date of Contact: April 30, 1996

Contacted by: Telephone

Company/Agency: Iowa Beef Packers, Inc. (IBP)
Dakota City, NB

Telephone Number: (402) 241-2036

Person(s) Contacted/Title(s)

Kim Dirks

CONTACT SUMMARY:

Mr. Dirks is the environmental contact for the IBP plant in Logansport, IN and was suggested to MRI by Pat Powlen, the Indiana permit writer for that plant. Mr. Dirks is interested in providing MRI with additional test data and assisting with the revision of the existing AP-42 section on the TTN. We discussed several aspects of the rendering process.

For blood driers, the emission levels of ammonia and hydrogen sulfide are very dependent on the "age" of the blood. Fresh blood from in-house operations has a much lower NH_3 and H^2S levels than "old" blood that has been stored and shipped into the facility. For VOC emissions, the fat from beef and pork will show a difference in the content. Beef fat is a "harder" fat and has a lower VOC emission level the pork fat, which is a "softer" fat.

He will send us any test data that he can -- IBP has a number of rendering facilities but actually has done only 2 or 3 tests. IBP does primarily in-house rendering but does render some blood and fat from their small facilities. Kim will send some comments he has on the current section on the TTN. I told him that it would be probably 6-9 months before the section would be revised.

CONTACT REPORT--MRI Project No. 4603-01-03

From: Tom Lapp, Environmental Engineering Department

Date of Contact: April 30, 1996

Contacted by: Telephone

Company/Agency: Indiana Dept. of Environmental Management
Office of Air Management

Telephone Number: (317) 232-8443

Person(s) Contacted/Title(s)

Mr. Ed Surla, Chief, Compliance Data Section

CONTACT SUMMARY:

Called Mr. Surla to obtain an explanation on why the process data for the blood drier was not used in any calculations in the test report. He could not find the file for Indiana Packers Company so we talked primarily from my copy of the test report. He did not specifically remember the test but we were able to discuss some of the test. According to Mr. Surla, the process data in Appendix F for both the meat cooker and the blood drier indicates that both processes were in operation during the test and the measured emissions were from both processes. However, the operating permit limits are based on tons of cooked fat and all calculations of lb of pollutant per ton processed would be based only on the tons of meat cooked. The emission rate would not include the processing rate for the blood drier even though the total emissions measured during the test are coming from both sources.

CONTACT REPORT--MRI Project No. 4601-08

From: Tom Lapp, Environmental Engineering Department

Date of Contact: July 21, 1994

Contacted by: Telephone

Company/Agency: State of New Jersey, Dept. of Environmental Protection, Division of Environmental Quality

Telephone Number: (609) 530-4042

Person(s) Contacted/Title(s)

Mr. Micheal Klein, Supervisor, Bureau of Technical Services

CONTACT SUMMARY:

MRI called the Emission Testing Branch in the New Jersey DEP (609) 292-6710 but was told to contact the Technical Services Department for information on existing test reports for individual companies. Mr. Klein was our contact person.

There are no emission test reports or test data for emissions from the canning process for fruits or vegetables. There are some data for emissions from the can coating process but no other processes.

Mr. Klein was questioned on the availability of test reports for all of the other Food and Agricultural sections. He stated that there are several meat rendering plants in New Jersey that have odor problems but no emission testing has been performed. There may be some data on breweries but was not sure.

Mr. Klein stated that the New Jersey files are arranged by company, by location and plant identification number. In order to get easy access to their system, they would have to know the specific location of the plant and the ID number. There are no cross reference files for company/industry/product.

CONTACT REPORT--MRI Project No. 4604-04-03

From: David Bullock, Environmental Engineering Department

Date of Contact: September 19, 1996

Contacted by: Telephone

Company/Agency: Iowa Beef Packers, Inc. (IBP)
Dakota City, NE

Telephone Number: (402) 241-2036

Person(s) Contacted/Title(s)

Mr. Kim Dirks

CONTACT SUMMARY:

Called Mr. Dirks to tell him that MRI received the Storm Lake, Iowa, and the Dakota City, Nebraska rendering plant test reports. I told him that the reports appeared to be usable, but that they were both lacking process data necessary for calculating emission factors. He said that he had the process data for both reports (the State agency had also requested the process data) and that he would provide it to MRI.

Mr. Dirks said that the third test report he had mentioned in a voice mail left for Dr. Lapp was already in the mail to MRI. He said that this test report includes a section providing process data.

I asked Mr. Dirks if he was still interested in reviewing and commenting on the Meat Rendering section of AP-42. He indicated that he was still interested. I explained to him that the background report for the section included additional information and explained how the AP-42 section was developed. He indicated that he would like to review and comment on both the background report and the section. I told him that MRI would send the report to him promptly. He asked about a time frame for reviewing the report. I indicated that there was no specific deadline, but that we would like comments as soon as reasonably possible, and that I would speak with Dr. Lapp to reach a mutually agreeable time period.

Mr. Dirks' street address for FedEx/Airborne shipping is:

IBP, Inc.
ATTN: Mr. Kim Dirks
Mail Drop #130
Highway 35
Dakota City, Nebraska 68731

Mr. Dirks stated that IBP has 20 to 25 rendering plants and that more emission tests are scheduled over the next several months (over the next year?). He asked if MRI would be interested in the results of these emission tests. I indicated

*/1

that MRI would be interested, but that we may need to set a cut off for accepting new data in order to finalize the section. I said that I would speak to Dr. Lapp about the time frame for finalizing the report.

I told Mr. Dirks that MRI would be developing an AP-42 section for meat packing and asked if he or IBP, Inc. had dealt with the relevant trade associations and if he would be interested in assisting with that report. He said that he did deal with the trade associations. He also indicated that he would be interested in assisting with the section, and that IBP, Inc. plants included both rendering plants and packing plants. I asked if he would like to assist with the process description and if IBP, Inc. would be able to provide test data for the meat packing section. He said that he would assist with the process description and provide test data. I told Mr. Dirks that I would speak with Dr. Lapp about the process description and whether IBP, Inc. would draft the language for the section, or provide information and comment on an MRI draft. Concerning the meat packing test data, Mr. Dirks said that emission points were generally rendering operations and boilers, but that there were some other emission points and area sources of particulate matter emissions.

Mr. Dirks offered to arrange a site visit to an IBP rendering plant to help MRI understand rendering processes. I told him that I would speak with Dr. Lapp about the possibility.

*/2

PROKOP Enviro Consulting
P.O. Box 602
Deerfield, Illinois 60015

Telephone
(708) 945-1465

December 13, 1994

Mr. Dallas W. Safriet
Environmental Engineer
Emission Inventory Branch
Office of Air Quality Planning & Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Dear Mr. Safriet:

This is in reply to your letter of October 27th to Don Franco of the National Renderers Assoc. (NRA) who referred your letter to me. I am the Consulting Director of Engineering for NRA and provide services to them on environmental issues and other areas of rendering plant operations.

As we discussed on December 9th, your draft report entitled "Emission Factor Documentation for AP-42, Section 9.5.3 for Meat Rendering Plants," has been reviewed by the NRA Plant Operations Committee.

In your report, you refer to two types of rendering plants: independent and integrated. NRA represents the independent segment whereas the American Meat Institute (AMI) located in Arlington, VA represents the integrated segment that applies to animal slaughterhouses and meat packing plants. It is my understanding that as yet AMI has not been contacted regarding this draft report.

Our primary recommendation to the USEPA is that this report should NOT be published. It cites only one series of three tests which were conducted to provide emission data from a blood dryer. The EPA in this report gives this emission data an E (poor) rating, its lowest. In addition, less than 10 percent of the independent rendering plants in the U.S. actually process whole animal blood. On page 1-1 of this report, it is stated that "an emission factor is a representative value." It is absolutely clear that the emission factors shown in Table 4-1 on page 4-3 are not representative of the meat rendering industry and therefore are not relevant.

Another important point should be made regarding the data presented in Table 4-1. No attempt is made in this draft report to apply a statistical analysis to this data, probably because of its scarcity. As an example, the data in Table 4-1 for ammonia is averaged to obtain an estimated mean value of 0.67 lb/hr. The standard deviation of the variability obtained with this data is estimated to be $\pm$ 0.21. Assuming a normal distribution, if it is desired to have a 95 percent confidence level that the true mean value can be determined, it would occur between 0.25 and 1.09.

It should be understood that the basic air pollution problem in the rendering industry concerns the control of odor emissions. All of our efforts regarding the monitoring of these emissions are focused primarily on surveying the surrounding neighborhood for the presence of odors and where it is necessary, monitor stack odor emissions by the use of odor dilution to threshold measurements conducted with odor sensory panels.

Analyzing for individual compounds by gas chromatograph/mass spectrometric techniques is rather expensive. The odor detection thresholds of most of these odorous compounds range from 1 to 50 parts per billion. As a result, the concentrations of these compounds in stack emissions from control equipment are probably less than 1 part per million and are not perceived to be harmful at these concentrations.

As we discussed, you still wish to publish this report in order to be "on record" to indicate that such emission factors are not available for meat rendering plants. As indicated below, we have furnished additional comments that apply to the proposed AP-42 Section 9.5.3. Most of the text in the sections entitled General, Process Description, Emissions and Controls was excerpted from Reference No. 1, the Air Pollution Engineering Manual, 1992.

Certain corrections are provided below for specific parts of the text along with the relevant pages of the draft report:

1) page 9.5.3-1, 1st line: <u>Glue</u> is no longer manufactured in rendering plants.

2) page 3-1, 5th line, 2nd paragraph: Inedible rendering plants are also a part of integrated rendering operations.

3) page 3-5, Figure on batch cooker rendering process. Correct title of figure. This figure should include a condenser which receives the vapor emissions from the batch cookers, condenses the water vapor and emits the noncondensibles as VOC emissions.

4) page 3-6, 1st paragraph: Continuous rendering process description should also include more recent continuous systems that describe evaporators operated under vacuum (see pp. 558-559 of Reference No. 1).

5) 3rd paragraph, 2nd line: "raw material is introduced into a batch cooker with water". No excess water is added with the poultry feathers and hog hair. Adequate moisture is present in this raw material to accomplish chemical hydrolysis and its conversion into amino acids.

6) page 3-7, 1st paragraph: The odorous compounds listed represent the best available qualitative data on odor emissions from animal cooking and pressing operations. However, no quantitative data was obtained in this particular study. As indicated previously, the odor detection thresholds of these compounds are quite low; some as low as 1 ppb or less. As a result, the VOC emissions from rendering plants are not perceived to be a significant air pollution problem, either regarding the formation of ozone or as a hazardous air pollutant.

7) page 3-7, last sentence: The control technologies associated with odor emissions from rendering plants are divided into two categories: 1) those controlling high intensity odor emissions from the rendering process, and 2) those controlling plant ventilating air emissions. As indicated, boiler incineration and multistage wet scrubbing are used to control the process odor emissions whereas single stage wet scrubbing is used exclusively to treat the plant ventilating air. It would be helpful to make this distinction.

8) page 3-8, 1st line: "Boiler incinerators are the most common control technology because boilers are used ----." This is not an accurate statement. Multistage wet scrubbing is equally effective as incineration and is used just as frequently to treat the high intensity odors from the rendering process. This paragraph should be split into at least two separate paragraphs and it could be organized much better to describe this control technology.

9) page 3-8, line 14: "Activated carbon adsorption and catalytic oxidation are used to control odor." Although these two odor control technologies are being used in other applications, we have no specific knowledge that they are used in rendering plants.

This concludes our comments. We appreciate having this opportunity to review this EPA draft report.

Sincerely,

William H. Prokop

William H. Prokop, P.E.
Consulting Director of
Engineering Services

National Renderers Assoc.

WHP/eh

PROKOP Enviro Consulting

December 14, 1994

Mr. Dallas W. Safriet
USEPA

Dear Mr. Safriet:

Attached is the last page of my letter to you dated December 13th. This was omitted yesterday.

Sincerely,

WILLIAM H. PROKOP, P.E.

duske engineering co., inc.

April 20, 1996

Mr. Andrew Roeder
IBP, INC.
Dakota City, NE

SUBJECT: Emissions Testing of TPD-8000 Bone Dryer
in Dakota City, NE on April 5 and 6, 1996
Our Project No. 590

Dear Mr. Roeder:

We have looked at the Test Runs No. 3, 4, and 5 of ENSR Project 3661-015-300 and the dryer inlet temperature record during those runs and offer the following opinion:

In general, we believe that the dryer performance during the three tests represent a realistic day to day operation of a bone dryer with its stops and starts of feed, variation in moisture and volume of feed, and some down time. We understand that the time lag between centrifuge and dryer feed is 10 minutes.

For example, when run No. 3 was started, the dryer had not reached steady state operation and the inlet temperature was coming down from 1400 F and was at 1200 F at test start. This may be responsible for the relatively high emission rate. Inlet temperature range was 750 - 1200°F.

Run No. 4 was during a very steady operation resulting in relatively low emissions. Inlet temperature range was 735-950°F.

Run No. 5 included about one hour of no product feed from about 2:00 p.m. to 3:00 p.m. Although the inlet temperature ranged high from 755 to 1650°F, we believe that the no-feed time with low emissions offset the expected high emission period during high inlet temperature.

Please let us know if we can of further assistance.

Very truly yours,
DUSKE ENGINEERING

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