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Subject: Site Visit--Viskase Corporation, Bedford Park, Illinois
NESHAP for Miscellaneous Cellulose Manufacturing Industries
EPA Contract No. 68-D6-0012; Task Order No. 0021; ESD Project No. 97/06
MRI Project No. 4801-21

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I. Purpose

The purpose of the site visit to Viskase Corporation in Bedford Park, Illinois was to obtain information on (1) the manufacturing processes used to produce cellulose food casings, (2) emissions of any hazardous air pollutants (HAP), and (3) any methods employed by the plant to prevent or reduce HAP emissions.

II. Place and Date

Viskase Corporation
6855 West 65th Street
Chicago, Illinois 60638

May 6, 1998

III. Attendees

Viskase Corporation (Viskase)

Chuck Mackus, Plant Engineer
Robert Odewald, Manager, Environmental Affairs (Corporate)
James Weir, Chicago Plant Manager
Paul Zwijack, Quality Assurance/Environmental Manager

Illinois Environmental Protection Agency

Henry Naour, Manager, Toxics Unit, Permit Section
Nat Zala, Environmental Protection Engineer, Field Operations Section

U. S. Environmental Protection Agency (EPA)

William Schrock, Environmental Engineer

Midwest Research Institute (MRI)

Thomas Holloway, Staff Environmental Scientist
Rebecca Nicholson, Senior Environmental Engineer

IV. Discussion

A. Background

The Viskase food casings plant in Bedford Park, Illinois is the “swing-plant” in the Viskase company. The Bedford Park plant runs the specialty operations. It produces the widest variety of food casings of all the Viskase plants, approximately 1,500 types of food casings, each with different performance criteria. Consequently, the Bedford Park plant handles significant swings in production. Over the past 15 years, the plant has run from as little as one extrusion machine to full capacity. (The other Viskase plants run consistently at or near capacity.) The amount of product produced at the Bedford Park plant has dropped slightly due to market conditions. *(Information about the production capacity and percent utilization for 1997 for the Bedford Park plant is contained in the confidential addendum, item 1.)*

Production rate at the plant also varies due to seasonal factors. Under the Bedford Park plant’s reasonably available control technology (RACT) requirements, a limit is imposed on production at the plant during the summer months. Ozone levels are highest during this time, so emissions of carbon disulfide (CS_2) have to be reduced. To compensate for this lower production level, the Bedford Park plant builds inventory over the rest of the year to use during the summer months.

The Bedford Park plant has been in continuous operation for 65 years and currently has 285 employees associated with plant production. The number of employees is 320 if those associated with corporate operations are included. The Bedford Park plant is ISO 9000 certified. The Bedford Park plant operates three shifts per day, 24 hours per day, 365 days per year. The viscose production process at the plant never shuts down. Time and temperature limitations in the viscose production process require continuous operation. Consequently, the extrusion machines are always running; the plant rotates the machines so that the process is continuous. Much of the equipment at the plant is “doubled” so that equipment can be switched in the event of a malfunction. Following the background discussion, Mr. Mackus provided an overview of the process, as described below.

B. Process Description

Attachment 1 is a simplified flow diagram of the cellulose food casings manufacturing process at the Bedford Park plant. The production of cellulose food casings begins by reacting cellulose (in the form of wood pulp sheets) with sodium hydroxide (NaOH) in a steeping press to produce alkali cellulose. The alkali cellulose is then mechanically shredded and aged. The aged alkali cellulose is then fed to a reactor, referred to as a baratte, where it is reacted with CS_2 to form cellulose xanthate. The cellulose xanthate is subsequently dissolved in a dilute NaOH solution in a vissolver to form the viscose. The batch portion of the process ends here. The viscose is then aged or "ripened" in viscose ripening tanks, filtered to remove unreacted alkali cellulose and gels, and deaerated to remove entrapped air.

The viscose is used in one of three casing production processes at the plant--"Nojax®," fibrous, or large casing. In the Nojax® and large casings processes, the viscose is extruded through a nozzle, goes up through an aquarium acid bath, and is regenerated in a series of sulfuric acid (H_2SO_4) tubs. During regeneration, the casing is sent through a chilled water tub to slow the reaction. The regenerated casing is then sent through water tubs to wash the casing. A plasticizer (glycerin) is added to the casing in the final wash stages to "soften" the casing and make it more pliable. The casing is then dried and reeled.

In the fibrous casings process, paper is used as the substrate for viscose. The paper is mechanically formed into a tube, and the tube is coated with the viscose. The coated paper tube then goes down through an aquarium acid bath, and the coating is regenerated in the acid bath. *(Further information about the regeneration process is contained in the confidential addendum, item 2.)* The tube is sent through water wash tubs, as well as a desulfurizing tub, weak acid tub, and glycerin tub; then it is dried and reeled. *(The type of agent used in the desulfurizing tub is contained in the confidential addendum, item 3.)*

The following paragraphs describe the processing steps and associated equipment in more detail.

1. Raw Material Storage and Handling. Primary raw materials used in the manufacture of food casings include: cellulose (in the form of highly refined wood pulp sheets), NaOH, CS_2, H_2SO_4, and glycerin. The Bedford Park plant has a tank farm onsite where the storage tanks for the chemicals are located.

The only materials used at the Bedford Park plant that are considered HAP's are CS_2 and ethylene glycol. Ethylene glycol is stored onsite in a 2,000-gallon (gal) tank in a 50 percent solution with water. As noted in the Bedford Park plant's Section 114 survey response, the ethylene glycol is used plantwide in process air temperature control, process cooling jackets (in shredding, xanthation, vissolving, aging, preparing NaOH and H_2SO_4 solutions, etc.), and chilled water systems. Because the ethylene glycol is used in a closed system, emissions would only occur as the result of equipment leaks. However, ethylene glycol has a low vapor pressure, and, thus, little if any would vaporize if it leaked out.

Liquid CS_2 is shipped to the Bedford Park plant by railcar. A nitrogen blanketing system is used during shipping, unloading, transfer, and storage to preclude CS_2 contact with oxygen for safety reasons. Nitrogen is used to transfer CS_2 from the railcar to the storage tanks. As noted in the Bedford Park plant's Section 114 survey response, the nitrogen unloading system was installed at the plant in the mid-1980's. Before the nitrogen unloading system was installed, water was used for unloading to preclude CS_2 contact with oxygen; however this resulted in 10,000 gal of CS_2-saturated water and 10,000 gal of water partially saturated with CS_2 being sent to wastewater treatment each time a railcar was unloaded. An overhead water deluge system above the railcar unloading area is available as an additional safety measure in the event of a railcar catastrophe. The unloading area slopes toward the CS_2 storage tank area, so that any CS_2 spills during unloading can be collected and stored safely under water.

Liquid CS_2 is stored onsite in two 15,000-gal pressurized storage tanks. Each storage tank is blanketed with nitrogen, which is vented back to the railcar during unloading of the railcar as part of a closed-loop unloading system. The tanks operate as totally independent systems; when one tank is shut down, the other can be used. The tanks are submerged in water in a rectangular concrete pool. The water in the pool is heated in winter to prevent freezing. The tanks are coated with a corrosion inhibitor to prevent any corrosion of the tanks from the water. The water pool reduces emissions of CS_2 from the storage tanks because any CS_2 that could leak from the tanks would drop to the bottom of the pool because of the higher density of the liquid CS_2. The bottom of the concrete pool slopes to one side so that CS_2 spills/leaks can be detected and collected. This side of the pool has a continuous remote sensor for CS_2. If CS_2 is detected, the sensor triggers an alarm in the power house.

A nitrogen pump system is used to pump the CS_2 from the storage tanks to the plant. The pipe from the pump to the plant is a stainless steel welded pipe; there are no fugitive emissions of CS_2 from this pipe. The pump system is on a timer so that only enough CS_2 for one batch is sent through the pipe to the plant; after each batch, the pump system is shut off.

All flanges and pumps used in CS_2 storage and transfer undergo leak detection. Viskase personnel visually inspect every flange for "sweating" every day to determine if there are any CS_2 leaks. If there is "sweating," a fume test is conducted. Only one to two leaks have been detected over the last 4 years.

2. <u>Production of Alkali Cellulose and Viscose</u>. Attachment 2 is a flow diagram of the production process for alkali cellulose and viscose at the Bedford Park plant. The production of cellulose food casings begins by reacting the highly refined wood pulp sheets with a solution of NaOH in one of the plant's steeping presses. *(The number of steeping presses is contained in the confidential addendum, item 4.)* The water in the NaOH solution is chilled using the glycol cooling system described above. The cellulose sheets are manually loaded into the steeping presses, where they remain for a specified time and temperature. *(The specified time and temperature are contained in the confidential addendum, item 5.)* Each steeping press is a rectangular tank that is fitted with vertical metal plates, in between which the cellulose sheets are loaded. After the NaOH is added, the pulp swells to 5 to 10 times its actual thickness, and the NaOH cuts the cellulose chains to shorter lengths that can be used in the process.

After steeping, the NaOH solution is drained from the press, and a ram at the end of each steeping press collapses the plates together to squeeze out excess NaOH. The excess NaOH solution is filtered and recycled back to the process. The saturated sheets then drop down into one of the plant's shredders, which, over a specified time, mechanically shreds the pulp. *(The number of shredders and the shredding time are contained in the confidential addendum, items 6 and 7, respectively.)*

After shredding, the alkali cellulose is aged over the course of 4 to 36 hours in aging vessels in a temperature-controlled room. (The length of the aging process depends on the type of wood used in making the wood pulp.) *(The aging period currently used at Bedford Park plant is contained in the confidential addendum, item 8.)* The aging process decreases and controls the degree of polymerization of the cellulose.

Once the desired cellulose chain length is obtained through the aging process, the alkali cellulose is charged into one of several batch xanthation vessels, or "barattes." *(The specific numbers of barattes used to produce viscose for the Nojax®, large, and fibrous casings processes are contained in the confidential addendum, item 9.)* Liquid CS_2 is gravity fed to the baratte from a weigh scale and is reacted with the alkali cellulose. The specific amount of CS_2 added is determined at the weigh scale. A vacuum is applied to the baratte prior to adding the CS_2. The baratte slowly rotates to mix the alkali cellulose and CS_2. The CS_2 volatilizes and reacts with the alkali cellulose. As the CS_2 is consumed, the liquid CS_2 continues to volatilize, until all of it is consumed. Only about 1.1 percent of the CS_2 is estimated to be unreacted. The pressure inside each baratte is continuously monitored during the reaction. *(The length of each baratte reaction is contained in the confidential addendum, item 10.)* The reacted material, referred to as sodium cellulose xanthate, is manually removed from each baratte.

A vacuum is applied to the baratte after the reaction cycle is complete to remove unreacted CS_2 before the baratte is opened. To reduce worker exposure to CS_2, overhead vents feed fresh air to the baratte workers, and floor exhausts pull emissions away from the workers. (Carbon disulfide vapors are heavier than air.) Although over 90 percent of the CS_2 emissions are from the extrusion process, the highest CS_2 concentration emitted is from the barattes.

As the sodium cellulose xanthate is removed from the baratte, it is fed to one of the plant's vissolvers, where it remains for a specified period of time. *(The number of vissolvers and the vissolving period are contained in the confidential addendum, items 11 and 12, respectively.)* In the vissolver, the sodium cellulose xanthate is mixed with a cold, dilute solution of NaOH to complete the formation of the viscose. (A cold NaOH solution is used because the cellulose xanthate dissolves more easily cold than hot.) Each of the vissolvers has a cooling jacket filled with ethylene glycol for cooling. Any CS_2 that builds up in the head space of each vissolver is vented to the main exhaust.

After the vissolver, the process is continuous. The viscose is sent to a receiving tank, then through a porous 6-inch filter to remove large clumps, to a heat exchanger, and to viscose ripening tanks. *(The number of viscose ripening tanks is contained in the confidential addendum, item 13.)* The ripening process is completely automated, occurring over a specified time, which is tightly controlled, and a specified temperature. *(The specified time and temperature are contained in the confidential addendum, item 14.)* Glycol cooling jackets are used to cool the ripening tanks. During ripening, the viscose ages, and the index (gelation rate) of the viscose drops to the desired level. Emissions from the ripening tanks are vented to the main exhaust.

Following the ripening tanks, the viscose used in Nojax®, large, and fibrous casings processes is filtered to remove any unreacted alkali cellulose. *(Information about the filtering process and the number of filters is contained in the confidential addendum, item 15.)* The filtered viscose is then sent to a deaerator, which is under near absolute vacuum, to take out any entrapped air in the viscose. Once the viscose has been ripened, filtered, and deaerated, it is ready for the extrusion process. Prior to extrusion, the viscose is maintained at a specified temperature. *(The specified temperature is contained in the confidential addendum, item 16.)* When the viscose is ready for the extruders, the temperature of the viscose is brought back up to a specified higher temperature using a heat exchanger. *(The specified higher temperature is contained in the confidential addendum, item 17. The time period required from the beginning of the process [i.e., the loading of the cellulose sheets into the steeping press] until the ripened viscose is ready for the extruders is contained in the confidential addendum, item 18.)*

3. Nojax® Casings Production. Attachment 3 is a simplified flow diagram of the Nojax® casings process at the Bedford Park plant. In the Nojax® casings process, the ripened viscose is pumped to the Nojax® casing extrusion area, where the viscose is metered to one of the plant's continuous extruders. *(The number of extruders is contained in the confidential addendum, item 19.)* The amount of viscose metered to the extrusion machines varies, depending upon the desired product. In the extruders, the viscose is extruded through a nozzle, goes up through an "aquarium" acid bath (filled with dilute H_2SO_4), and is regenerated in a series of H_2SO_4 tubs, as well as a chilled water tub, which slows the reaction. After regeneration, the casing is sent through a series of water tubs to wash the casing.

The acid and water tubs are totally enclosed in vertical plexiglass "cabs," which provide air flow to the product for proper curing; the cabs primarily serve to reduce worker exposure to CS_2. As the casings pass from the extruders and through the tubs during the regeneration process, gases evolve inside and outside the casings. Gases that evolve inside the casings cause the casings to swell, which requires the casings to be slit at set intervals. *(Further information about the slitting process is contained in the confidential addendum, item 20.)* Most of the hydrogen sulfide (H_2S) evolves at the beginning of the regeneration process. Most of the CS_2 evolves later in the process, as the water temperature in the tubs increases (up to a specified temperature). *(The specified temperature is contained in the confidential addendum, item 21.)* Approximately 50 percent of the CS_2 emissions are from the extrusion and regeneration areas; the other 50 percent are from the wash area. Most of the H_2S emissions are from the extrusion and regeneration area, including the acid sump exhausts. The gases from the aquariums and the tubs are exhausted through the main exhaust.

After the casings pass through the acid and water tubs, they are dipped into a water tub containing glycerin, which is a plasticizer used to "soften" the casings and make them more pliable. *(The concentration of the glycerin is included in the confidential addendum, item 22.)* At this point in the process, essentially all of the residual CS_2 has been emitted.

Following the glycerin tub, the casings are sent through a pre-dryer to an operator, who removes the slitted sections and patches the cut pieces with a hollow casing tube to allow for air flow in the dryers that follow. The patched casings are reinflated prior to the dryers. The casings are then sent to the dryers, which are vented to the atmosphere. *(Information about the type of dryer and the drying process is contained in the confidential addendum, item 23.)* Finally, the semi-finished casings are wound on reels and shipped offsite to a casing finishing plant.

4. Fibrous Casings Production. Attachment 4 is a simplified flow diagram of the fibrous casings process at the Bedford Park plant. In the fibrous casings process, the ripened viscose is pumped to the fibrous casing extrusion area, where the viscose is metered to one of the plant's continuous extruders. *(The number of extruders is contained in the confidential addendum, item 24.)* In the fibrous casings process, paper is used as the substrate for the extruded viscose. Unlike the Nojax® casings process, where the primary strength of the casing comes from the viscose, viscose strength is not as important for the fibrous casings process; the paper provides the necessary strength. The paper comes off as a sheeted roll cut to the desired size. The paper is mechanically formed into a tube, and the tube is coated with the viscose. The viscose penetrates the paper and bonds and seams the tube together. The coated paper tube then goes down through an aquarium acid bath, and the coating is regenerated in a series of H_2SO_4 tubs. *(Further information about the regeneration process is contained in the confidential addendum, item 25.)*

Following regeneration, the tube is sent through a series of water tubs for washing, a desulfurizing tub, another water tub for washing, a weak H_2SO_4 tub for neutralization, a glycerin tub for softening, and the pre-dryer. *(The type of agent used in the desulfurizing tub is contained in the confidential addendum, item 26.)* There is countercurrent flow in the water and acid baths. All ventilation for the fibrous process (aquarium and tubs) goes below ground in a tunnel vent before going to the stack.

After the pre-dryers, the fibrous casings are sent to dryers, which are vented to the atmosphere. *(Information about the type of dryer and the drying process is contained in the confidential addendum, item 27.)* Finally, the semi-finished casings are wound on reels and shipped offsite to a casing finishing plant.

5. Large Casings Production. The large casings process is essentially the same as the Nojax® casings process, except that a larger amount of ripened viscose is metered to the plant's continuous extruders. *(The number of extruders is contained in the confidential addendum, item 28.)*

C. Acid Recovery

Acid bath solution (H_2SO_4) that has been used in the extrusion and regeneration process is recovered in the plant's acid bath system. The acid bath system is ventilated, with room and sump exhausts going to the plant's main exhaust. Although CS_2 and H_2S emissions from the acid bath system have not been tested, plant personnel indicated that only small amounts of CS_2 and H_2S would be present in these two exhausts. In acid recovery, the acid bath solution is fed to one of two evaporators. The evaporators apply heat and vacuum to the acid bath solution to boil the solution and evaporate the water. The plant is left with a more concentrated acid salt solution that it can reuse. The evaporator condensate (hot water) is sent to the sewer system. In the future, the plant may reuse the condensate. Unlike the Viskase plant in Osceola, Arkansas, the Bedford Park plant does not have a sodium sulfate (Na_2SO_4) crystallizer. Sulfur that has accumulated in the acid baths is periodically filtered out in the acid bath system using anthracite filters.

D. Wastewater Treatment

The Bedford Park plant uses approximately 3 million gal of water per day. Wastewater from the extrusion, regeneration, and washing process areas is sent to wastewater treatment. Storm water and process water from the plant exit using the same sewer. Some of the NaOH used in the fibrous casing production process is reclaimed in the sewer. The head space in the trenches, which contains trace amounts of CS_2 and H_2S, is vented under negative pressure through the main exhaust. Wastewater treatment at the plant consists primarily of pH adjustment; there is no equalization. (It is not necessary for compliance.) However, the wastewater is sampled before it leaves the plant. Wastewater is sent for offsite treatment at a publicly owned treatment works (POTW).

The CS_2 levels in the wastewater sent to the POTW typically vary between 5 and 15 parts per million by volume (ppmv). In its Section 114 survey response, the plant estimated that 135,000 pounds of CS_2 are present per year in the combined wastewater stream exiting building Manhole 1A. There are approximately 936 million gal of wastewater per year in this combined stream. No data are available for any wastewater upstream of Manhole 1A. As mentioned previously, a significant source of CS_2 emissions was eliminated when the nitrogen unloading system was installed because it eliminated the practice of sending 10,000 gal of CS_2-saturated water and 10,000 gal of water partially saturated with CS_2 to the wastewater treatment plant each time a railcar of CS_2 was unloaded.

E. Emissions and Emission Controls

1. Emissions. Carbon disulfide is the only HAP that is reported as being emitted from the Bedford Park plant. A non-HAP, H_2S, also is emitted from the cellulose food casings production process along with the CS_2. The Bedford Park plant estimates that approximately 95 percent of the liquid CS_2 weighed into the process is released as CS_2 and H_2S emissions. The other 5 percent ends up in the wastewater (as CS_2 and sulfides) and as elemental sulfur or other sulfur byproducts. On a plant-wide basis, approximately 78 percent of the total emissions are CS_2, compared to 22 percent that are H_2S. According to the Bedford Park plant's Section 114 survey response, CS_2 emissions from the main stack for 1997 were estimated to be approximately

714 tons per year (ton/yr); H_2S emissions were estimated to be approximately 204 ton/yr. An additional 2 ton/yr of CS_2 are estimated to be emitted from CS_2 unloading, storage, and transfer processes.

The CS_2 and H_2S emissions for 1997 were estimated using 1997 CS_2 usage data and mass balance information. The total process CS_2 emissions were estimated using a CS_2 emission factor of 0.72 pounds of CS_2 emitted from process stacks per pound of CS_2 weighed into the process. This emission factor represents emissions from both the baratte room and the casing production area. The emission factor was developed based on the results of a 1990 stack test at the Bedford Park plant. Emissions of CS_2 from the baratte room were estimated to average 1.1 percent of the CS_2 weighed into the process. This percentage was determined based on the results of a 1988 stack analysis at the Bedford Park plant. Emissions of CS_2 from the casing production area were estimated by subtracting the baratte emissions from the total process emissions. The total H_2S emissions were estimated by subtracting the total process CS_2 emissions (equal to 72 percent of the CS_2 weighed into the process) from the amount of CS_2 released to the air as CS_2 or H_2S (equal to 95 percent of the CS_2 weighed into the process); the resulting number was converted from pounds of H_2S as CS_2 to pounds of H_2S by using the molecular weight ratio of $2H_2S:1CS_2$ (68/76).

Approximately 98 percent of the CS_2 and H_2S emissions are associated with the casing production area (where extrusion, regeneration, and washing occur). Of the CS_2 emissions from the casing production area, approximately 50 percent are from the extrusion and regeneration areas; the other 50 percent are from the wash area. Most of the H_2S emissions are from the extrusion and regeneration area, including acid sump exhausts. The most concentrated CS_2 emissions are associated with the baratte room (where xanthation occurs). According to the Bedford Park plant's Section 114 survey response, the concentration of CS_2 in the emissions from the baratte room is about 2,600 ppmv, compared to 83 ppmv in the casing production area.

2. Emission Controls. Attachment 1 shows the emission points from the cellulose food casings manufacturing process. As shown in Attachment 1, emissions from the viscose and casing production areas are routed to the main process exhaust stack. (All ventilation for the fibrous casings process goes below ground through a tunnel vent before going to the stack). The main exhaust line also picks up any gases existing in the head space in the sewers (referred to as "trench exhaust" in Attachment 1). The trench exhaust is under negative pressure. The exhaust from the dryers is vented to the atmosphere because all of the CS_2 and H_2S have been released from the casings prior to drying. *(Information about the type of dryer is contained in the confidential addendum, item 29.)*

Prior to their release from the main stack, the emissions pass through one of four packed-bed scrubbers for H_2S removal. The CS_2 and any residual H_2S are then emitted to the atmosphere. Not all of the scrubbers at the Bedford Park plant are operated at the same time; during the site visit to the plant, only two of the scrubbers were being operated. As noted in the Bedford Park plant's Section 114 survey response, the H_2S scrubbers were installed at the plant in the early 1970's. Of the four scrubbers at the plant, two are vertical scrubbers, with flow rates of 60,000 actual cubic feet per minute (acfm) each; the other two are horizontal scrubbers, with flow rates of 40,000 acfm each. The total inlet flow rate to the scrubbers is 200,000 acfm. The scrubbers typically handle inlet H_2S concentrations of 60 to 70 ppmv. The residence time in the scrubbers is about 1 second. The scrubbers consistently achieve 90 percent control of the H_2S emissions, but they do not control CS_2 emissions.

The Bedford Park plant previously used NaOH in the H_2S scrubbers. However, the NaOH used in the scrubbers was very corrosive, and sodium sulfide (Na_2S) was being formed in the scrubber as a result of controlling the H_2S. The plant sold the Na_2S to a paper company, but the plant was still concerned about the hazards. Consequently, the plant switched from the NaOH system to a new, proprietary "lo-cat" system. The lo-cat system is a packed-bed scrubber system that uses chelated iron to oxidize/reduce the H_2S to produce a grayish white sulfur cake (containing about 50 percent moisture). Iron content and pH are key parameters in the lo-cat system. The sulfur that builds up in the scrubbers is sent to a scrubber settling tank and is filtered (to dewater) prior to being sent to a landfill. About 80 to 100 cubic yards of sulfur per year are produced by the scrubbers. The sulfur is landfilled because the plant has been unable to find a company that can use the reclaimed sulfur. The reclaimed sulfur contains chelate impurities, which reduces its usefulness.

The Bedford Park plant has four scrubber stacks, each about 140 to 150 feet tall and about 6 feet in diameter. One (older) stack is used for the horizontal scrubbers; two other stacks are used for the vertical scrubbers. The fourth stack is a by-pass stack.

As mentioned in Section B.1, the Bedford Park plant modified the CS_2 unloading system in the mid-1980's for safety reasons. In its Section 114 survey response, the plant estimated that the replacement of the water-containment system with a nitrogen system resulted in a reduction of 2.5 ton/yr in fugitive CS_2 emissions, depending on the number of rail cars unloaded per year. The plant also estimated current fugitive losses from the unloading, storage, and transfer of CS_2 to be 1.3 tons of CS_2 per year. To estimate the fugitive CS_2 emissions, the plant used emission factors for flanges and valves from an EPA document (Emission Factors for Equipment Leaks of volatile organic compounds (VOC) and HAP, EPA-450/3-86-002, January 1986, Table 3-3). The Bedford Park plant is not subject to any State or Federal leak detection and repair (LDAR) programs.

3. Emission Standards. The Bedford Park plant is required to comply with standards regarding workplace exposure to CS_2 from the U.S. Occupational Safety and Health Administration (OSHA). The plant is currently subject to an OSHA standard of 20 ppmv for CS_2; OSHA had previously tightened the standard to 4 ppmv before this standard was repealed. However, the plant still meets the 4 ppmv level. (Baratte operation and maintenance activities at the Bedford Park plant were exempted from the OSHA 4 ppmv standard.) The Bedford Park plant monitors compliance with the OSHA standard by personnel monitoring and by monitoring the CS_2 concentrations in the viscose and casing production areas. The ventilation system at the plant is designed with the goal of lowering worker exposure to CS_2. Consequently, the plant produces large volumes of process and building exhaust air to dilute emissions from the more concentrated CS_2 emission points. Fans at the plant are currently sized at 200,000 acfm.

The plant did not need to change its ventilation system when the OSHA standard changed to 4 ppmv, but the plant did add fugitive “pick-ups” at low areas in the plant that may occasionally have higher levels of CS_2. To reduce worker exposure to CS_2 in the baratte room, overhead vents feed fresh air to the baratte workers, and floor exhausts pull emissions away from the workers to the main exhaust. To reduce worker exposure to CS_2 in the casing production area, the regeneration and washing tubs are totally enclosed in vertical cabs, and the CS_2 emissions are exhausted through the main exhaust. Because CS_2 is highly flammable and is easily ignited, the plant has also added temperature sensors to ducts that carry CS_2 exhaust, as a safety measure. Motion sensors have been installed on all process air fans to alert operators (by alarm) of a fan failure. All ducts have been equipped with “observation and access” doors as an added safety measure following a severe fire at a cellulose food casing plant in 1987.

The Bedford Park plant must also comply with RACT requirements regarding the quantity of CS_2 that can be emitted from the plant. According to the RACT requirements attached to the plant’s Section 114 survey response, CS_2 emissions from the Bedford Park plant must never exceed 3.30 tons per day (ton/day). During the summer ozone season (June through August), CS_2 emissions must not exceed 2.22 ton/day on a monthly average and 2.44 ton/day on a daily average. These requirements are included in the plant’s State operating permit and in a site-specific Federal Implementation Plan (FIP) approved by the EPA (40 CFR 52.741). In order to comply with the CS_2 requirements during the summer months, the Bedford Park plant limits its production during those months. The plant compensates for this lower production level by building inventory over the rest of the year and using it during the summer months.

4 Attachments

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Attachment 1

Attachment 2

Attachment 3

Attachment 4