

US EPA ARCHIVE DOCUMENT

COAL GAS

A. Commodity Summary

In 1992, more than 997,545,000 short tons of coal were produced by 2,746 mines located in the United States.¹ Coal is classified into four general categories: bituminous, subbituminous, lignite, and anthracite coal. Nearly all coal is used in combustion or coking. At least 80 percent is burned directly in boilers for generation of electricity or steam. Small amounts are used for transportation, space heating, and firing of ceramic products. The rest is essentially pyrolyzed to produce coke, coal gas, ammonia, coal tar, and light oil products from which many chemicals are produced. Combustible gases and chemical intermediates are also produced by the gasification of coal, and different carbon products are produced by various heat treatments. A small amount of coal is used in miscellaneous applications such as fillers, pigments, foundry material, and water filtration.²

Coal gasification produces a synthetic gas that is either further processed and sold as synthetic natural gas or used to fire a gas turbine, generating electricity in an integrated gasification combined cycle (IGCC) system. As shown in Exhibit 1, there is only one commercial scale synthetic gas producer, and two commercial scale IGCC plants.³ The Tennessee Eastman facility is used in the production of acetic anhydride. There are also several demonstration scale projects funded, at least in part, by the U.S. Department of Energy's Clean Coal Technology (CCT) program, including two coal preparation technologies, one mild gasification project, and one indirect liquefaction project, as well as six IGCC systems.⁴ Exhibit 2 lists the Clean Coal Projects, their sponsors, locations, types of technology, and status. In addition to the CCT demonstration projects, there may be other planned or operating private demonstration scale projects. The profitability of existing facilities and the potential for the opening of new plants will be affected by the prices of traditional fuel sources such as oil and gas.

EXHIBIT 1

SUMMARY OF COMMERCIAL COAL GASIFICATION FACILITIES

Facility Name	Location	Type of Process
Great Plains Coal Gasification Plant, Dakota Gasification Co. ^a	Beulah, ND	Synthetic Gas
Louisiana Gasification Technology, Inc. ^a	Placamine, LA	IGCC
Tennessee Eastman ^b	NA	IGCC

^a - U.S. EPA, Report to Congress on Special Wastes from Mineral Processing, July 1990, p. 5-1.

^b - "Coal Conversion Processes (Gasification)," Kirk-Othmer Encyclopedia of Chemical Technology, Vol 6, 4th. ed. 1993, pp. 543.

¹ U.S. Department of Energy, Coal Production 1992, Energy Information Administration, October 1993, p. 18.

² "Coal," Kirk-Othmer Encyclopedia of Chemical Technology, 4th ed., Vol VI, 1993, p. 424.

³ A fourth subsidized commercial scale facility (Cool Water) operated from 1982 to 1988 in Daggett, California. This facility shut down after the Department of Energy funding ended.

⁴ U.S. Department of Energy, Clean Coal Technology Demonstration Program: Program Update 1993, December 31, 1993, pp. 7-2 - 7-3.

EXHIBIT 2

SUMMARY OF CLEAN COAL TECHNOLOGY DEMONSTRATION PROJECTS^a

Project Name	Sponsor	Location	Technology	Project Stage
Self-Scrubbing Coal: An Integrated Approach to Clean Air	Custom Coals International	Central City, PA	Coal Preparation	Design/ Permitting
Advanced Coal Conversion Process Demonstration	Rosebud SynCoal Partnership	Colstrip, MT	Coal Preparation	Operating
ENCOAL Mild Coal Gasification Project	ENCOAL Corporation	Near Gillette, WY	Mild gasification	Operating
Commercial Scale Demonstration of the Liquid-Phase Methanol (LPMEOH) Process	Air Products and Chemicals, Inc.	Kingsport, TN	Indirect Liquefaction	Project Definition
Combustion Engineering IGCC Repowering Project	ABB Combustion Engineering, Inc.	Springfield, IL	IGCC	Assessing Project Options
Camden Clean Energy Demonstration Project	Duke Energy Corp.	Camden, NJ	IGCC	Negotiating Cooperative Agreement
Pinon Pine IGCC Power Project	Sierra Pacific Power Company	Reno, NV	IGCC	Design
Toms Creek IGCC Demonstration Project	TAMCO Power Partners	Coebum, VA	IGCC	Project Definition
Tampa Electric Integrated Gasification Combined Cycle Project	Tampa Electric Company	Lakeland, FL	IGCC	Design/ Permitting
Wabash River Coal Gasification Repowering Project	Wabash River Coal Gasification Repowering Project Joint Venture	West Terre Haute, IN	IGCC	Construction

^a - U.S. Department of Energy, "Clean Coal Technology Demonstration Program: Program Update 1993," December 31, 1993, pp. 6-22, 6-23, & 6-27.

B. Generalized Process Description

1. Discussion of Typical Production Processes

Coal gasification is essentially incomplete combustion of coal, producing a product gas and heat instead of carbon dioxide and heat. In combustion, oxygen in stoichiometric excess reacts with the combustible matter in coal, mostly carbon and hydrogen, to produce heat, the primary product of interest, as well as carbon dioxide and water. Gasification involves the incomplete combustion of coal in the presence of steam. Only 20-30 percent of the oxygen theoretically required for complete combustion to carbon dioxide and water is used; therefore, only a fraction of the carbon in the coal is oxidized completely to carbon dioxide, the rest forms a mixture of gases including carbon monoxide, methane, hydrogen and hydrogen sulfide. The heat released by the partial combustion provides the

bulk of the energy necessary to drive the gasification reactions.^{5,6} When synthetic gas is produced as a product, lignite coal is sized, and gasified with steam and oxygen producing raw gas, ash, and gasifier liquor. The gas is cooled, purified in several steps, and sold. This process is described in greater detail below.

2. Generalized Process Flow Diagram

There is currently one facility, the Great Plains Coal Gasification Plant, which produces synthetic natural gas on a commercial scale. Exhibit 3 illustrates the production of synthetic natural gas at this facility. The facility employs 12 Lurgi Mark IV high pressure coal gasifiers, with two gasifiers on standby for spare capacity. Exhibit 4 is a schematic diagram of a Lurgi Mark IV Gasifier. Lignite coal, which is taken from four mines that are co-located with the facility, is crushed and fed to the top of individual gasifiers through a lock-hopper system; steam and compressed oxygen are introduced at the bottom of each gasifier.⁷ The steam and oxygen travel up through the coal/ash bed. As steam and oxygen contact the coal in the gasifier, the resulting combustion reactions produce two major gases, carbon dioxide and carbon monoxide. The further reaction of these gases with carbon and steam results in "gasification," the formation of carbon oxides, methane, and hydrogen.⁸

After gasification occurs, excess carbon remains in the form of "char." The char is combusted in a high-temperature exothermic (heat releasing) reaction to provide energy for a series of reactions, including drying, devolatilization, and gasification, most, but not all, of which are endothermic (heat using) reactions. The char is then converted to energy in the "combustion zone," roughly the middle of the gasifier. The residue of this combustion is the gasifier ash. The gases formed in these reactions rise to the top of the unit, where their heat dries and drives off volatiles liberated from the coal that has just entered the gasifier.⁹ Because not all of the flue gas constituents are converted in the gasification process, the exiting gas stream contains both flue gas and product gas. These two gaseous streams are separated downstream of the gasifiers and the product gas is converted to salable methane.¹⁰

The ash remaining in the bed after the reaction is removed by a rotating grate at the bottom of the gasifier and is discharged through a gas lock. The ash is discharged into an enclosed ash sluiceway, where recirculating ash sluice water is introduced to cool the ash and transport it to the ash handling and disposal area. The hot crude product gas leaving the gasifiers goes through several operations, including quenching (to cool and clean), shift conversion (to alter the ratio of hydrogen to carbon monoxide), further cooling of the gas, and processing through the Rectisol unit (to remove sulfur compounds and carbon dioxide). The desulfurized crude gas is sent to the methanation unit; the product gas is then compressed and dried for delivery to a pipeline for distribution.¹¹

The quenching operation described above, in addition to cooling the raw gas, serves to remove entrained particles from the gas and to condense and remove unreacted steam, organic compounds, and soluble gases. This cooling operation generates an aqueous stream known as quench liquor (labelled "sourwater" in Exhibit 3). This quench liquor, along with similar streams from the shift conversion, gas cooling, and rectisol units, are sent to the gas liquor separation unit (for removal of tar and oil), to a phenosolvan unit (for phenol recovery), and to a phosam-W ammonia recovery unit

⁵ "Coal Conversion Processes (Gasification)," Kirk-Othmer Encyclopedia of Chemical Technology, 4th ed., Vol. VI, 1993, p. 551.

⁶ "Steam," Kirk-Othmer Encyclopedia of Chemical Technology, 3rd ed., Vol. XXI, 1983, pp. 543-544.

⁷ CDM Federal Programs Corporation, Draft Report American Natural Gas Special Study, Prepared for U.S. Environmental Protection Agency, Office of Waste Programs Enforcement, March 19, 1987, pp. 14-27.

⁸ Dakota Gasification Company, "Letter to Mr. Robert Tonetti and Mr. Bob Hall, Office of Solid Waste, U.S. EPA", August 12, 1991, p. 5.

⁹ Ibid.

¹⁰ Dakota Gasification Company, "Lurgi Gasification and Flue Gas Scrubbing Simplified," Memorandum to D. W. Peightal from T. G. Towers, July 29, 1991.

¹¹ CDM Federal Programs Corporation, 1987, Op. Cit., pp. 14-27.

(for ammonia recovery). The process water leaving the phosam-W unit, known as stripped gas liquor, is classified as a RCRA special waste.

This process wastewater is used as makeup water for a water cooling system that is needed to cool the gasifiers during operation. The hot water is routed to a cooling tower used to remove heat from the system. Evaporation from the cooling tower exceeds the quantity of stripped gas liquor generated on an annual basis; hence, all stripped gas liquor is used as makeup water. The stripped gas liquor passes through the cooling tower (not shown) where it is concentrated, reducing the volume by a factor of ten, and through the Multiple Effects Evaporator (not shown) where it is concentrated again, further reducing the volume by a factor of ten. This concentrate then goes to the Liquid Waste Incinerator (LWI) for incineration. The blowdown water from the LWI is used as makeup water to the ash sluice system.^{12,13}

3. Identification/Discussion of Novel (or otherwise distinct) Process(es)

In an IGCC unit, oxygen, pulverized coal, and sometimes steam are gasified, and the syngas is cooled, cleaned and combusted to power a gas turbine, to generate electricity. Excess heat is also recovered to generate electricity using a steam turbine. IGCC, coking, and pyrolysis are considered to be energy producing operations rather than mineral processing, and are therefore outside the scope of this report.

4. Beneficiation/Processing Boundaries

EPA established the criteria for determining which wastes arising from the various mineral production sectors come from mineral processing operations and which are from beneficiation activities in the September 1989 final rule (see 54 Fed. Reg. 36592, 36616 codified at 261.4(b)(7)). In essence, beneficiation operations typically serve to separate and concentrate the mineral values from waste material, remove impurities, or prepare the ore for further refinement. Beneficiation activities generally do not change the mineral values themselves other than by reducing (e.g., crushing or grinding), or enlarging (e.g., pelletizing or briquetting) particle size to facilitate processing. A chemical change in the mineral value does not typically occur in beneficiation.

Mineral processing operations, in contrast, generally follow beneficiation and serve to change the concentrated mineral value into a more useful chemical form. This is often done by using heat (e.g., smelting) or chemical reactions (e.g., acid digestion, chlorination) to change the chemical composition of the mineral. In contrast to beneficiation operations, processing activities often destroy the physical and chemical structure of the incoming ore or mineral feedstock such that the materials leaving the operation do not closely resemble those that entered the operation. Typically, beneficiation wastes are earthen in character, whereas mineral processing wastes are derived from melting or chemical changes.

EPA approached the problem of determining which operations are beneficiation and which (if any) are processing in a step-wise fashion, beginning with relatively straightforward questions and proceeding into more detailed examination of unit operations, as necessary. To locate the beneficiation/processing "line" at a given facility within this mineral commodity sector, EPA reviewed the detailed process flow diagram(s), as well as information on ore type(s), the functional importance of each step in the production sequence, and waste generation points and quantities presented above in Section B.

EPA determined that for the production of coal gas, the beneficiation/processing line occurs between coal preparation and coal gasification due to the chemical reaction that occurs between oxygen, steam, and coal within the gasification unit that significantly changes the physical/chemical structure of coal. Therefore, because EPA has determined that all operations following the initial "processing" step in the production sequence are also considered processing operations, irrespective of whether they involve only techniques otherwise defined as beneficiation, all solid wastes arising from any such operation(s) after the initial mineral processing operation are considered mineral processing wastes, rather than beneficiation wastes. EPA presents below the mineral processing waste streams generated after the beneficiation/processing line, along with associated information on waste generation rates, characteristics, and management practices for each of these waste streams.

C. Process Waste Streams

1. Extraction and Beneficiation Wastes

¹² North Dakota State Department of Health, Letter to Robert L. Duprey, Director, Waste Management Division, EPA, June 10, 1986. p. 1.

¹³ CDM Federal Programs Corporation, 1987, Op. Cit., pp. 41-42.

Wastes from the extraction and beneficiation of coal may include gangue, fines, baghouse coal dust, and coal pile runoff. Run-of-mine lignite from neighboring mines is crushed to less than 2 inches. Fines are removed by screening and are sent to an adjacent power plant. Baghouses collect the dust from crushing, conveying, sizing, and storage operations. Coal dust collected in the baghouses is returned to the process. Coal pile runoff is handled by the plant's storm drainage system, which includes a coal pile runoff retention pond. This pond provides sufficient retention time to permit coal particles, soil sediments, and dust suspended in the stormwater to settle out. The clarified water from the pond is discharged to the stormwater pond through an overflow weir.¹⁴

2. Mineral Processing Wastes

Gasifier Ash is classified as a RCRA special waste. This ash is removed from the bottom of the gasifier, quenched, passed through crushers to reduce the maximum size to eight centimeters, and sluiced into ash sumps for settling and dewatering. The dewatered ash is trucked to an on-site clay-lined landfill, where it is disposed of along with ash from boilers, superheaters, and incinerators, and settled solids from process water management units (e.g., impoundments, API separators.)¹⁵ The North Dakota Department of Health reported that the Beulah facility had considerable problems with their dewatering system which resulted in the disposal of large quantities of very wet ash.¹⁶ According to the Newly Identified Mineral Processing Waste Characterization Data Set, approximately 301,000 metric tons of gasifier ash are produced annually in the United States.¹⁷

Process Wastewater is classified as a RCRA special waste.¹⁸ According to the Newly Identified Mineral Processing Waste Characterization Data Set, approximately 5,143,000 metric tons of process wastewater are produced annually in the United States.¹⁹ The management of the process wastewater (i.e., stripped gas liquor) is reuse; the water is used as make-up water for the water-cooling system that cools the gasifiers. Specifically, the process wastewater is routed from the cooling tower to the multiple effect evaporators, to the liquid waste incinerator, and finally to the gasifier ash handling system.

Surface Impoundment Solids (Cooling Tower Pond Sludge) - When the supply of process wastewater generated on a daily basis exceeds the need for cooling system make-up water, the process wastewater is stored in an impoundment until it is needed. No long-term accumulation of waste occurs in this unit; the water is pumped to the cooling tower and any settled solids are dredged (approximately 13 metric tons in 1988) and sent to the solid waste disposal landfill.²⁰ Existing data and engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

Zeolite Softening PWW - Available data do not indicate that the waste exhibits hazardous characteristics.²¹ Therefore, the Agency did not evaluate this material further.

Cooling Tower Blowdown - Evaporation of water inside the cooling water system increases the concentration of any impurities in the make-up water remaining in the cooling system; these impurities can lead to scaling or other operational problems in the system. Therefore, the cooling water in the system is bled off at a rate of 360-500 gpm to prevent concentrations of impurities from reaching unacceptable levels. This concentrated bleed, known as cooling tower

¹⁴ Ibid., pp. 63-64.

¹⁵ U.S. Environmental Protection Agency, Report to Congress on Special Wastes from Mineral Processing, Volume II, Office of Solid Waste, July 1990, p. 5-3.

¹⁶ North Dakota State Department of Health, 1986, Op. Cit., pp. 1-2.

¹⁷ U.S. Environmental Protection Agency, Newly Identified Mineral Processing Waste Characterization Data Set, Vol. I, Office of Solid Waste, August 1992, p. I-3.

¹⁸ U.S. Environmental Protection Agency, 1990, Op.Cit., p. 5-3.

¹⁹ U.S. Environmental Protection Agency, 1992, Op.Cit., p. I-3.

²⁰ U.S. Environmental Protection Agency, 1990, Op.Cit., p. 5-3.

²¹ U.S. Environmental Protection Agency, 1992, Op. Cit., p. I-3.

blowdown, was generated at a rate of approximately 766,000 metric tons in 1988. The cooling tower blowdown is treated in a multiple effects evaporator (MEE) unit.²²

According to the Newly Identified Mineral Processing Waste Characterization Data Set, approximately 646,000 metric tons of cooling tower blowdown are produced annually in the United States.²³ Existing data and engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

Multiple Effects Evaporator Concentrate - Cooling tower blowdown is treated in a multiple effects evaporator (MEE) unit. Distillate from this treatment is returned to the cooling system or used as other facility utility water. The remaining residual, MEE concentrate, is returned as feed to the gasifier or is sent to an on-site liquid waste incinerator (LWI). Separate surge ponds are used for storage of MEE distillate and concentrate.²⁴ MEE concentrate has been found to exhibit the characteristic of EP toxicity for arsenic and selenium. The arsenic levels range from 3-29 ppm and the selenium levels from 15-44 ppm.²⁵ This waste stream is partially recycled and classified as a by-product. Although no published information regarding the waste generation rate was found, we used the methodology outlined in Appendix A of this report to estimate a low, medium, and high annual waste generation rate of 0 metric tons/yr, 0 metric tons/yr, and 65,000 metric tons/yr, respectively.

Multiple Effects Evaporator Pond Sludge - Approximately 100 cubic yards of MEE pond sludge are generated annually in the United States.²⁶ Existing data and engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

Liquid Waste Incinerator Blowdown - Spent cooling water from the LWI unit, referred to as LWI blowdown, is sent to the coal ash sluice area to be included as make-up water for ash handling. Any incinerator ash/solids in the blowdown are, therefore, combined with the gasifier ash and managed as such.²⁷ LWI blowdown was found to exhibit the characteristic of EP toxicity for arsenic and selenium. The arsenic levels range from 6-16 ppm and the selenium levels from 7-54 ppm.²⁸ Although no published information regarding the waste generation rate was found, we used the methodology outlined in Appendix A of this report to estimate a low, medium, and high annual waste generation rate of 0 metric tons/yr, 0 metric tons/yr, and 45,000 metric tons/yr, respectively. LWI blowdown is recycled in process, therefore, it is not included in the analysis.

Liquid Waste Incinerator Pond Sludge - Approximately 300 cubic yards of liquid waste incinerator pond sludge are generated annually in the United States.²⁹ Existing data and engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

Spent Methanol Catalyst - The methanation unit uses a nickel catalyst to upgrade the synthetic gas to methane. The spent catalyst is recycled.³⁰ Although no published information regarding waste generation rate or

²² U.S. Environmental Protection Agency, 1990, Op.Cit., p. 5-4.

²³ U.S. Environmental Protection Agency, 1992, Op. Cit., p. I-3.

²⁴ U.S. Environmental Protection Agency, 1990. Op. Cit., p. 5-4.

²⁵ North Dakota State Department of Health, 1986, Op. Cit., p. 1.

²⁶ Versar, Inc. Draft Site Visit Report on Dakota Gasification Company, Prepared for U.S. Environmental Protection Agency, Office of Solid Waste, August 4, 1989. p. 3.

²⁷ As reported by Dakota Gasification Company, approximately 32,000 metric tons of LWI blowdown was generated in 1988 with a solids content of 5 percent; these approximately 1,600 metric tons of solids are assumed to be included in the total volume of gasifier ash reported by the company.

²⁸ North Dakota State Department of Health, 1986, Op. Cit., p. 1.

²⁹ Versar, Inc., 1989, Op. Cit., p. 3.

³⁰ CDM Federal Programs Corporation, 1987, Op. Cit., p. 6.

characteristics was found, we used the methodology outlined in Appendix A of this report to estimate a low, medium, and high annual waste generation rate of 0 metric tons/yr, 5,000 metric tons/yr, and 45,000 metric tons/yr, respectively. This waste stream is not hazardous, therefore, it is not included in the analysis.

Stretford Solution Purge Stream - The Stretford process uses a dilute solution of sodium carbonate, sodium bicarbonate, sodium metavanadate, and anthraquinone disulfonic acid (ADA) to remove hydrogen sulfide from a number of gas streams and convert it to elemental sulfur. After hydrogen sulfide removal, the treated gas stream is incinerated in the boilers for its fuel value. The Stretford solution purge stream contains vanadium salts, thiosulfate, thiocyanate, and ADA. The purge stream is collected in a wastewater tank, concentrated in a crystallizer, and subsequently disposed of as a liquid. This liquid crystallizes into a solid during cooling after it is transported to a secure disposal site. The liquid removed during concentration is used as cooling tower makeup water.³¹ Although no published information regarding waste generation rate or characteristics was found, we used the methodology outlined in Appendix A of this report to estimate a low, medium, and high annual waste generation rate of 5,000 metric tons/yr, 17,000 metric tons/yr, and 45,000 metric tons/yr, respectively. This waste stream is not hazardous, therefore, it is not included in the analysis.

Flue Dust Residues - Existing data and engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

Oily Water Treatment System

Oily water from all paved process areas drain to the oily water sewer. In addition, contaminated stormwater and other contaminated waters may be diverted to the oily water sewer, which drains into the oily water treatment system. This treatment system is intended to process contaminated water streams from the plant by reducing the oil content from between 10 and 100 ppm free oils to less than 5 ppm free oils. The system consists of American Petroleum Institute (API) separators, dissolved air flotation units, vacuum filtration of sludges and froths, and pressure media filtration. Effluent from this system is discharged to the cooling tower.

The oily water is pumped to two API separators in parallel. Oils are skimmed off and sent to the slop oil decanting tanks, while sludge is scraped off the bottom and transferred to the froth sump. The slop oil is used as fuel for the boilers. Effluent from the API separators is transferred to the dissolved air flotation units where air, coagulant aid, and caustic or acid are added to assist in removing any remaining oils. Under some plant operating conditions, this API separator effluent is routed to cooling tower surge ponds following treatment.

Oils from the top and sludges from the bottom of the DAF unit are transferred to the froth sump. DAF effluent is passed through sand filters before it is used as cooling tower makeup water. The API/DAF sludge in the froth sump is sent to the vacuum precoat drum filter. This equipment is operated only when sufficient quantities of sludge have accumulated. The filter cake is collected in hoppers for off-site disposal and the filtrate is returned to the oily water sewer.³²

API Water - Existing data and engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

API Oil/Water Separator Sludge - Approximately 1,500 cubic yards of API oil/water separator sludge are generated annually in the United States.³³ These sludges are disposed of off-site.³⁴ Existing data and engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

Dissolved Air Flotation Sludge - Approximately 2,688 cubic yards of dissolved air flotation sludge are generated annually in the United States.³⁵ The DAF sludges are disposed of with the gasifier ash.³⁶ Existing data and

³¹ Ibid., pp. 52-58.

³² Ibid., pp. 36-37.

³³ Versar, Inc, 1989, Op. Cit., p. 3.

³⁴ CDM Federal Programs Corporation, 1987, Op. Cit., p. 7.

³⁵ Versar, Inc., 1989, Op. Cit., p. 3.

³⁶ CDM Federal Programs Corporation, 1987, Op. Cit., p. 7.

engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

Sludge and Filter Cake - Existing data and engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

Vacuum Filter Sludge - The vacuum filter sludge is generated intermittently. This stream is disposed of with the ash in the plant's ash handling system.³⁷ Existing data and engineering judgement suggest that this material does not exhibit any characteristics of hazardous waste. Therefore, the Agency did not evaluate this material further.

D. Ancillary Hazardous Wastes

Ancillary hazardous wastes may be generated by cleaning operations that generate up to 3,350 gallons of spent solvents each year; laboratory services that may generate 1,800 gallons of hazardous waste (F002, F003, F004, and D002) each year; and container storage, which could generate hazardous wastes from spills, and the associated clean up activities. Non-hazardous wastes may include tires from trucks and large machinery, sanitary sewage, and waste oil (which has been analyzed and found to be non-hazardous).³⁸

³⁷ Ibid., p. 39.

³⁸ Ibid., pp. 73-76.

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