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3 Coal Preparation Plants - Subpart Y

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3 Coal Preparation Plants - Subpart Y

3.1 Introduction

On January 15, 1976, under Section 111 of the Clean Air Act, as amended, the U.S. Environmental Protection Agency (“U.S. EPA”) promulgated standards of performance for new and modified coal preparation plants. This guidance document presents procedures for inspection of coal preparation facilities in order to determine permit compliance and compliance with this New Source Performance Standard (NSPS). This document also provided background information that will aid the inspector in understanding the coal preparation process and the effects of operating parameters on process emissions.

Background information on the coal preparation industry is presented in Section 3.2, which describes the purpose of coal preparation, and the geographic location of plants.

Section 3.3 describes the coal preparation process and the major process variations, outlining the function of process equipment, the potential emission points, and the emission control techniques currently in use in the coal preparation industry.

Section 3.4 deals with the emission regulations for the coal preparation industry, presenting a brief history of NSPS, a discussion of the standard, and a summary of emission regulations, including monitoring and record keeping requirements. Instrumentation and record keeping practices are discussed in Section 3.5.

Section 3.6 deals with emissions that occur during start-up, shutdown, and malfunction, with operational procedures for maintaining such emissions at or below the required levels. Section 3.7 presents in detail the inspection procedure and check points for observation during performance test. Test duration, operating conditions, and interpretation of instrument indications are discussed.

Section 3.8 outlines periodic inspection procedures and the relationship of periodic inspection data to those obtained in the initial performance test. In addition, Appendices A and B contain inspection checklists for performance tests and periodic compliance inspections, respectively.

3.2 Coal Preparation Industry

3.2.1 History of Coal Preparation

In the early part of this century efforts to prepare coal were directed to sizing the coal to supply lump coal for domestic use and intermediate sizes for industrial use; the fines were usually rejected as unfit for sale. Development of sizing facilities to meet the demands of the midcentury coal consumer resulted in highly sophisticated handling and screening facilities. Today’s market requires less sizing than ever before, the primary limit being maximum size for shipment.

Since the very early days of mining, attempts have been made to improve the quality of coal by removing slate. These efforts were made in the underground mines until the advent of mechanical mining, supported by hand picking outside of the mine. The first washing technique was imported from Europe, followed by the introduction of the “Chance” washer in 1918. The latter was an excellent washer utilizing sand and water as a medium, which has since been displaced by the “heavy media” process using magnetite. Through the years, many other types of washers have been
introduced and have been abandoned.

The means of drying have been improved, although the original screening equipment has been supplemented only by centrifuges. The adoption of Diester tables near the middle of the century to wash fine coal required supplementary equipment including centrifuges, froth flotation devices, disc filters, thickeners, cyclones, and thermal dryers.

### 3.2.2 Purpose of Coal Preparation

Coal preparation serves several purposes. One important purpose is to increase the heating value of the coal by mechanical removal of impurities. This is often required in order to find a market for the product. Run-of-mine coal from a modern mine may incorporate as much as 60 percent reject materials.

Air pollution control often requires partial removal of pyrites with the ash to reduce the sulfur content of the coal. Ash content often must be controlled to conform to a prescribed quality stipulated in contractual agreements. Because of firing characteristics, it is often as important to retain the ash content at a given level as it is to reduce it.

Freight savings are substantial when impurities are removed prior to loading. Finally, the rejected impurities are more easily disposed of at the mine site remote from cities than at the burning site, which is usually in a populated area.

### 3.2.3 Development of Mining Methods and Changing Preparation Standards

The earliest mining system used in England, from which U.S. practices evolved, was the long wall method. Mining could proceed from the shaft only a short distance because no forced ventilation was available. All the coal within this perimeter was removed prior to extending the shaft deeper or sinking a new one. No coal preparation of consequence was performed at this time.

The room and pillar method was used in underground mines in this country because of the nature of and easy accessibility of the coal beds. Strip mining was introduced during the second decade of this century, after the development of the steam shovel for the Panama Canal, and the long wall system was reintroduced on an experimental basis during the last 20 years. Auger mining was introduced with the spread of coal stripping, as a supporting method of recovering coal from underneath a highwall.

Until World War II most coal was loaded by hand and was obtained from the better seams of coal. Each worker was responsible for rejecting impurities and (sometimes) fines in the mine. Outside preparation equipment consisted of screens, crushers, and picking tables. Washeries were not common.

Exhaustion of the best coals and adoption of mechanical mining, which eliminated the removal of impurities in the mine, required the wider use of cleaning plants incorporating screens, crushers, picking tables, and washers. These plants normally practiced hand picking for the lump and egg sizes (more than three inches) and washed the coarser coal (three inches by one quarter of an inch). The fine coal (less than one quarter of an inch) was usually shipped raw. The reject from such a plant was unlikely to exceed ten percent of the run-of-mine (ROM) coal.

Introduction of the continuous miner requiring “full seam” mining, elimination of a large portion of the domestic market, and further exhaustion of the best coals imposed further requirements on the coal preparation plants. They were required to clean and dry the fine coal, the state of development that is current today. Picking tables have been eliminated, a fine-coal circuit has been
added, and rejection of 50 percent of the ROM coal is not uncommon.

Fluctuations in coal demand resulted in the dismantling of plants, some of which were incorporated into other or new plants, always of larger capacities. The trend has been to utilize one large plant to process coal from several mines, even from different seams, at the expense of additional freight charges and intensified refuse disposal requirements. Some plants, modified and expanded several times, are still operating at the original site after 50 years, long after the original mine has been abandoned.

3.3 Process Description

As it leaves the mine, coal varies widely in size, ash content, moisture content, and sulfur content. These are the characteristics that can be controlled by preparation. Sizes range upward to that of foreign materials, such as a chunk of rock that has fallen from the mine roof or a metal tie; large pieces of coal from a very hard seam are sometimes included.

Ash content ranges from three to sixty percent at different mines. Most of the ash is introduced for the roof or bottom of the mine or from partings (small seams of slate) in the coal seam.

This ash, called extraneous ash, is heavier than 1.80 specific gravity. The remaining ash is inherent in the coal. The density of coal increases with the amount of ash present.

The moisture content of the coal is also of two types. The surface moisture, that which was introduced after the coal was broken loose from the seam, is the easier to remove. This moisture is introduced by exposure to air, wet mining conditions, rainfall (in stockpiles), and water sprays. The remaining moisture, called “bed”, “cellular”, or “inherent” moisture, can be removed only by coking or combustion. This moisture was included during formation of the coal.

Foreign materials are introduced into the coal during the mining process, the most common being roof bolts, ties, car wheels, timber, shot wires, and cutting bits.

Sulfur in coal occurs as sulfates, organic sulfur, and pyrites (sulfides of iron). The sulfates usually are present in small quantities and are not considered a problem. Organic sulfur is bound molecularly into the coal and is not removable by typical coal preparation processes. Pyrites generally are present in the form of modules or may be more intimately mixed with the coal. Coal preparation plants remove only a portion of the pyritic sulfur; therefore the degree of sulfur reduction depends on the percentage of pyrites in the coal, the degree to which this is intimately mixed with the coal, and the extent of coal preparation.

All of the materials described above are combined with the coal to form the ROM feed. Coal, as referred to above, denotes the portion of the feed that is desired for utilization.

3.3.1 Capabilities of Coal Preparation

Coal preparation processes can improve the ROM coal to meet market demands, as limited by the inherent characteristics of a given coal. The top size of the ROM can be reduced to any size specified, although control of the varying size increments can be poor, depending on the amount of crushing required. No practical technology is known for increasing the sizes of coal as mined.

Although inherent moisture cannot be changed, the surface moisture can be reduced to any level that is economically practicable. Considerations include the possibility of reexposure to moisture during shipment and subsequent storage and the fact that intense thermal drying increases ideal conditions for readsorption of moisture.
The free sulfur in the coal is subject to removal only by chemical treatment, which is not a coal preparation process, or by combustion. The reason that the pyrites can be partially removed in washing processes is that they are heavy enough to be removed with the ash. The processes can remove only 30 to 60 percent of the pyrites, however, because some pyrites are not broken free of the coal and are present in a given piece in a quantity too small to increase its weight enough to be rejected.

Foreign metals can be removed easily. Most wood fragments can be removed, although a few small pieces of wood cause no particular harm because they are combustible.

3.3.2 Application of Cleaning Processes to Size Increments

Different types of mechanical cleaning apparatus are required for cleaning of coals in different size ranges. Coal larger than eight inches is usually crushed to a smaller size; when lump coal is required, the large fraction is cleaned by slate pickers. The nominal size ranges and the applicable cleaning equipment are listed in Table 3-1.

<table>
<thead>
<tr>
<th>Size Increment</th>
<th>Cleaning Equipment</th>
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</thead>
<tbody>
<tr>
<td>+ 8 inches</td>
<td>Picking tables</td>
</tr>
<tr>
<td>8 × 1/4</td>
<td>Heavy media bath or drums</td>
</tr>
<tr>
<td></td>
<td>Jigs</td>
</tr>
<tr>
<td>1/4 × 48M</td>
<td>Diester tables</td>
</tr>
<tr>
<td></td>
<td>Heavy media cyclones</td>
</tr>
<tr>
<td></td>
<td>Air tables</td>
</tr>
<tr>
<td>48M × 0</td>
<td>Froth flotation</td>
</tr>
</tbody>
</table>

Use of Thermal dryers is usually restricted to the two smaller size fractions. Occasionally, the +1/4-inch fraction is dried to permit screening.

3.3.3 Coal Sizing

The first operations performed on ROM coal are removal of tramp iron and reduction of size to permit mechanical processing. The schematic of a coal sizing circuit is shown in Figure 3-1.

The ROM coal is first exposed to a high-intensity magnet, usually suspended over the incoming belt conveyor which pulls the iron impurities out of the coal. This magnet sometimes follows the breaker, but always precedes a screen-crusher.

The coal then goes to the breaker, which is a large cylindrical shell with interior lifting blades; the shell is perforated with holes (two to eight inches in diameter) to permit passage of small material. The breaker rotates on a horizontal axis, receiving material in one end, tumbling it as it passes through the holes in the shell, and permitting the hard, large, unbroken material to pass out the rear of the machine. The small material (four inches) goes to the cleaning plant, and the large rejected
material falls into a bin to be hauled away.

Various types of crushers are available for coal crushing. The hammermill, shown in Figure 3-2, and the rotary breaker, shown in Figure 3-3, are most commonly used.

An alternate flow directs the ROM coal to a scalping screen, from which the oversize material (+ four inches) falls to a crusher, where it is reduced to four inches and is recombined with the screen underflow for transportation to the cleaning plant. This system is used more than the breaker but is somewhat vulnerable to large pieces which pass through the crusher and must be removed in a later process. The crusher most commonly used for this purpose is a heavy-duty single roll with tramp iron protection.

Double rolls are more difficult to maintain in this heavy service, are more expensive, and offer no particular advantage. Slow-speed hammermills or impactors are more difficult to maintain, and jaw crushers have not been required.

The raw coal is sometimes stored, prior to washing, to allow optimum scheduling of mine and plant operations. Open storage is the most common; silos are also used.

At mines using unit train shipment, prepared coal is stored to accumulate enough to fill a train. For this purpose, silos are used most often to prevent accumulation of moisture and exposure to wind. Some open storage is also practiced. At other mines, cars or barges are loaded directly as the coal is processed, received, and shipped each day.

3.3.4 Pneumatic Cleaning

Pneumatic cleaning devices, or air tables, are applied to the small fractions (less than 3/8 inches). In these devices, currents of air flow upward through a perforated bottom plate over which a layer of coal passes. The extreme fines are entrapped in the air and must be recaptured by cyclones and bag filters for return without quality improvement. As the coal reaches the end of the tables, the bottom layer is heavy (high-ash) material, a center layer is medium-weight coal and bone (high-ash), and the top layer is coal (low-ash). The middle layer must be incorporated with the refuse (and rewashed) or with the coal. The typical pneumatic cleaning circuit is shown in Figure 3-4. The cross-sectional view of an air table is shown in Figure 3-5.

The efficiency of these devices is poor. Their ability to remove ash is limited to two to three percent, regardless of how much is present. These devices represent the lowest capital investment of all cleaning devices, and they entail no problems of water supply and disposal.

The incoming coal must be screened, and, because feed to the tables must be dry, thermal drying of the raw feed is required at some plants. The thermal dryers, in turn, require cyclones and scrubbers for control of particulate emissions. Thermal dryers are fired with coal, oil, or gas.

3.3.5 Jig-table Washing

Jig-table washing plants are so named because jigs are used to clean the +1/4-inch increment and Diester tables to clean the 1/4 inch × 28M increment. Froth cells and/or thermal dryers may be used in conjunction with this equipment. Figure 3-6 shows a coal cleaning circuit with jig table. The air-pulsated coal jig is shown in Figure 3-7.
Figure 3-1. Coal Sizing Circuit
Figure 3-2. Hammermill

Figure 3-3. Rotary Breaker
Figure 3-4. Pneumatic Cleaning Circuit
Figure 3-5. Air Table
Figure 3-6. Jig Table Cleaning Circuit
Figure 3-7. Air-pulsated Jig

Figure 3-8. Deister Table
The raw coal, restricted to sizes smaller than eight inches, is separated on a wet screen (usually 1/4-inch mesh). The large-sized increment goes into the jig; the remaining coal is sent to a separate cleaning circuit. The coal is dewatered on screens and in centrifuges, crushed to the desired size, and loaded. The jig makes the “equivalent” gravity separation on the principles of settling in rising and falling currents. The small-sized coal (less than 1/4 inch) is combined with the proper amount of water and distributed to the tables, where the refuse is separated from the coal. The refuse is dewatered on a screen and discarded. The clean coal is dewatered on a sieve bend (a stationary gravity screen), where the extreme fines are removed and discharged into a centrifuge for final dewatering and removal of the fines. The clean coal (±28M) is then loaded or conveyed to a thermal dryer. The Diester table is a flat, “rifled” surface, approximately 12 feet square, which oscillates perpendicular to the “rifles”, in the direction of the flow of coal. The heavy rejects are discharged off one end of the discharge side of the table, the light coal is discharged from the opposite end, and the “middlings” are distributed between.

The slurry produced, along with the fines, requires clarification before recirculation is feasible. Clarification is described in Section 3.3.7 and portrayed in Figure 3-11.

3.3.6 Heavy-media Washing Plant

In a heavy-media washing plant, all the cleaning is done by flotation in a medium of selected specific gravity, maintained by a dispersion of finely ground magnetite in water. The plant is depicted in Figure 3-9.

The incoming raw coal is separated at 1/4 inch on an inclined screen. The “overs” proceed to a flat “prespawn” screen, where the fine dust particles are sprayed off from the +1/4-inch coal. This increment is discharged into a heavy-medium vessel or bath, where the refuse is separated from the coal. The refuse is discharged to a “refuse rinse” screen, where it is dewatered. The freed medium is divided into two parts, one returning directly to circulation via the heavy-medium sump and the other pumped to magnetite recovery. The refuse is discharged from the screen for disposal. The coal is discharged from the washer to a coal-rinse screen, where the coal is dewatered and the medium is treated as from the refuse screen. The clean coal is then centrifuged, crushed, and loaded. The fine coal (less than 1/4 inch) from the raw coal screens is combined with magnetite and water and pumped to a heavy-media vessel in that the magnetite is finer and the effective specific gravity is different. The refuse is dewatered and the medium is recovered, as in the coarse coal selection. The coal is discharged over a sieve bend and then proceeds to a centrifuge for final dewatering prior to transfer to a thermal dryer or to loading.

Because the magnetite recovered from the rinse screens is diluted by sprays, it is processed in magnetic separators for recovery of the solid mineral. Each washer (bath and cyclone) retains its own recovery system, which includes sumps, pumps, and magnetic separators. The separator is a shaft-mounted steel drum containing an interior fixed magnet. The cylinder rotates within a vessel containing coal slurry and magnetite, retrieving solid magnetite from the slurry by virtue of the magnetic qualities of the magnetite and the magnetic field within the drum.

The effluent from the centrifuges contains less than 28M coal, broken from larger pieces of clean coal. This material is thickened in a cyclone, deslimed on a screen, and centrifuged prior to loading.
3.3.7 Water Clarification Plant

The water clarification plant receives all the slurry from the washing plant, separates the 48M × 0 fraction for cleaning, and returns the water for reuse. The typical clarification plant is shown in Figure 3-10. The 48M × 0 fraction flows to froth flotation cells, where it is mixed thoroughly with a reagent (light oil). The coal accepts a coating of oil and floats off the top of the liquid to a disc filter, where the excess water is drawn through a fabric by a vacuum. The water is recirculated to the washery, and the fine coal is transported to loading or to a dryer.

The refuse does not accept the oil coating and sinks, to be removed with most of the incoming water to a static thickener. The thickener is a large, circular, open tank, which retains the water long enough to permit the particles of refuse to sink to the bottom. Clarified water is removed from the surface by “skimming troughs” around the perimeter of the tank and is recirculated to the cleaning plant.

The tank is equipped with a rotating rake, which rakes the fine refuse from the bottom of the tank to the center of the tank, where it is collected by a pump and transferred to a disc filter. The filter removes part of the water for recirculation and discharges the solids as refuse.

3.3.8 Thermal Drying

The clean coal from various wet cleaning processes is wet and requires drying to make it suitable for transportation and final consumption. Thermal drying is employed to dry the wet coal. Drying in the thermal dryer is achieved by a direct contact between the wet coal and currents of hot combustion gases. Various dryers marketed by different manufacturers work on the same basic principle. The most common types of dryers are shown in Figures 3-11 through 3-14.

The fluid-bed dryer is shown in Figure 3-11. The dryer operates under negative pressure in which drying gases are drawn from the heat source through a fluidizing chamber. Dryer and furnace temperature controllers are employed in the control system to readjust the heat input to match the evaporative load changes.

The multilouver dryer, shown in Figure 3-12, is suitable for large volumes and for the coals requiring rapid drying. The coal is carried up in the flights and then flows downward in a shallow bed over the ascending flights. It gradually moves across the dryer, a little at each pass, from the feed point to the discharge point.

The cascade dryer is shown in Figure 3-13. The wet coal is fed to the dryer by a rotary feeder; as the shelves in the dryer vibrate, the coal cascades down through them and is collected in a conveyor at the bottom for evacuation. Hot gases are drawn upward through and between the wedge wire shelves. The flash dryer is shown in Figure 3-14. The term “flash” is derived from the fact that the wet coal is continuously introduced into a column of high-temperature gases and moisture removal is practically instantaneous.
Figure 3-9. Heavy-media Cleaning Circuit
Figure 3-10. Water Clarification Circuit
Figure 3-11. Fluid-bed Dryer
Figure 3-12. Multilouver dryer.

Figure 3-13. Cascade Dryer
Figure 3-14. Flash Dryer
3.3.9 Emission Sources and Control Devices

All emission sources are subject to opacity regulations and two are subject to particulate concentration limits. The pneumatic cleaning plants generate emissions from the air tables and are subject to a 0.018 gr/dscf limit; thermal dryers are subject to 0.031 gr/dscf limit.

Emission points in the various plant sections are shown in the appropriate diagrams. The most commonly used control devices for each emission point are as follows:

1) Cyclone
2) Scrubber
3) Spray
4) Baghouse of fabric filter
5) Enclosure

3.3.10 Control Devices, Their Capabilities and Efficiencies

The various control devices are employed singly or in combination at each emission point according to the temperatures and volumes of flue gases, the degree of contamination, and the applicable regulations.

Cyclone sizes range from two inches to 18 feet in diameter, the smaller being applied in groups that use a common inlet and dust hopper. A cyclone serves as a primary separator because its efficiency is limited to particles larger than 44 microns. The efficiency is a function of the particle mass, inlet velocity, and the radius of the cyclone, increasing with smaller radii and higher inlet velocities. Pressure drop also increases with velocity. Some variables of cyclone design are indicated in Table 3-2.

Table 3-2. Cyclone Variables

<table>
<thead>
<tr>
<th></th>
<th>Diameter</th>
<th>Capacity (cfm)</th>
<th>Inlet Velocity (fps)</th>
<th>Pressure Drop (in.)</th>
<th>Smallest size Collected at 50 % eff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>2 in.</td>
<td>10</td>
<td>15</td>
<td>0.5</td>
<td>10</td>
</tr>
<tr>
<td>Max.</td>
<td>18 ft.</td>
<td>25,000</td>
<td>75</td>
<td>6.0</td>
<td>200</td>
</tr>
</tbody>
</table>

Cyclones are lined with refractories or water-jacketed for processing of hot gases and are fabricated of alloy steels for processing of corrosive gases.

Scrubbers are enclosures in which dust particles are agglomerated in small drops of water, which then flow from the vessel. In impingement-type scrubbers, agglomeration is accomplished by driving the dust-laden gas at high velocities onto flooded targets. Wet centrifugal separators pass the dust-laden air through a zone of high-velocity water droplets. Wet dynamic precipitators cause the dust to impinge on wetted fan blades. A venturi scrubber accelerates the dust-laden air through a venturi throat, where it atomizes the water to form droplets.

Scrubbers lose efficiency rapidly in collecting particles below five microns. Efficiency loss is
proportional to the pressure drop or power consumption. The major scrubber variables are presented in Table 3-3.

Table 3-3. Scrubber Variables

<table>
<thead>
<tr>
<th>Scrubber Type</th>
<th>Water Consumption per 1,000 cfm gas, gpm</th>
<th>Pressure Drop (in.)</th>
<th>Capacity (cfm)</th>
<th>Max. Efficiency, % (particle size range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impingement</td>
<td>3-5</td>
<td>6-8</td>
<td>90,000</td>
<td>95 (1-5 micron)</td>
</tr>
<tr>
<td>Centrifugal</td>
<td>4-10</td>
<td>2-6</td>
<td>140,000</td>
<td>90 (2-5 micron)</td>
</tr>
<tr>
<td>Dynamic</td>
<td>1</td>
<td>1</td>
<td>25,000^a</td>
<td>95^a (2-5 micron)</td>
</tr>
<tr>
<td>Venturi</td>
<td>3-15</td>
<td>12-60</td>
<td>140,000</td>
<td>98 (submicron)</td>
</tr>
</tbody>
</table>

^a Estimated

Scrubbers are used for control of thermal dryer emissions because they can accommodate gas temperatures up to 250 degrees Fahrenheit and are insensitive to the heavy moisture content. Orifice meters are commonly used for measuring the scrubber water flow rates. Table 3-4 presents the flow rate variables for six common orifice sizes.

Table 3-4. Orifice Flow Rates

<table>
<thead>
<tr>
<th>Pressure (lb/in^2)</th>
<th>Water flow (gpm) diameter of orifice (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3/16</td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>3.6</td>
</tr>
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<td>4.1</td>
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Baghouses or fabric filters are applicable for capture of fine particles of dust when the gases are at moderate temperatures, contain no sticky materials, and are nonexplosive.

The dust-laden stream is passed through a finely woven or felted fabric on which a layer of dust serves as the filtering medium. As this dust layer thickens, the bag is “shaken” mechanically or by abrupt pressure changes to remove a portion of the filter cake.

The filter is usually in the shape of a circular closed-end cylinder five to 12 inches in diameter and up to 30 feet long. Smaller filters are used to control emissions from bin and silo openings. The size of a filter installation depends on the amount of air and dust to be filtered. The ratio of air to filter cloth area depends on several variables; different services require different ratios or filtering velocities. The guidelines used for filtering of coal dusts are ratios of 6/1 for high dust loadings and elevated temperatures, progressing up to 8/1 for general dust loadings. Pressure differentials range from two to ten inches w.g.

3.4 Summary of New Source Performance Standards for Coal Preparation Plants

3.4.1 Applicability and Designation of Affected Facilities

Coal preparation plants processing less than or equal to 200 tons per day of coal are exempted by the New Source Performance Standard (NSPS). The affected facilities in the coal preparation plant's processing more than 200 tons per day are thermal dryers, pneumatic coal cleaning equipment (air tables), coal processing and conveying equipment (including breakers and crushers), coal storage systems, and coal transfer and loading facilities.

3.4.2 Definitions

Underground mining operations are not considered part of the coal preparation process. Coal storage and transfer sources are governed by the New Source Performance Standard (NSPS) only if they form a part of the coal preparation facility; isolated coal storage and transfer stations are excluded. Open coal storage piles are excluded from the definition of coal storage systems.

3.4.3 Emission Standards for Particulate Matter

Regulations governing emissions of particulate matter from coal processing facilities are as follows.

3.4.3.1 Thermal Dryer

Exhaust gases discharged into the atmosphere shall not contain particulate matter in excess of 0.070 gram/dry standard cubic meter (g/dscm) or 0.031 grain/dry standard cubic foot (gr/dscf) and shall not exhibit 20 percent or greater opacity.

---

1 40 CFR 60.250 (a)
2 40 CFR 60.250 (a)
3 40 CFR 60.251 (a)
4 40 CFR 60.251 (h)
5 40 CFR 60.252 (a) and Colorado Air Quality Control Commission Regulation No. 1 for Particulates, Smokes, Carbon Monoxide and Sulfur Oxides, Section II.A.1.
3.4.3.2 Pneumatic Coal Cleaning Equipment (Air Table)

The gases discharged into the atmosphere from an air table shall not contain particulate matter in excess of 0.040 g/dscm (0.018 gr/dscf) and shall not exhibit ten percent or greater opacity.\(^6\)

3.4.3.3 Other Facilities

The gases discharged into the atmosphere from other coal conveying, processing, and storage, transfer and loading facilities shall not exhibit 20 percent or greater opacity.\(^7\)

3.4.4 Monitoring of Operations

The NSPS regulations require continuous monitoring of exit gas temperature on the thermal dryer.\(^8\) If a venturi scrubber is used to control emissions from the thermal dryer, continuous monitoring of water supply pressure and of pressure loss through the venturi constriction are required.\(^9\)

3.5 Instrumentation and Records

Instrumentation for measurement of process parameters and methods of recording these measurements are important in controlling and predicting process emissions. The accuracy of predicting emissions can be directly related to the degree of sophistication of the instrumentation and record keeping at the plant. The instrument reading provides an instantaneous indication of operating conditions; detailed records will provide a basis for reviewing plant operations over an extended period.

The flow of coal through the preparation equipment is a function of the amount of coal input at the feeder conveyor. Overloading of the feeder conveyor will result in overloading of the equipment following it. Most of the equipment incorporates an indicator showing instantaneously the load being processed.

In older plants, most equipment control is of the ON-OFF type. In case of overloading, a red light comes on and the equipment is automatically stopped. These ON-OFF lights do not indicate in advance a potential malfunction or overload and are not helpful for indication of emissions.

The newer and larger plants generally incorporate a central control room with automated instrumentation showing the instantaneous loading and other major parameters such as pressure drop and temperature of the gases. The monitoring records of required process parameters are also maintained in this central control room.

When the instruments indicate abnormal operating conditions, the operator can take action to prevent possible major equipment malfunction or plant shutdown. The use of instrument readings for predicting plant emissions is discussed in Section 3.8.

---

\(^{6}\) 40 CFR 60.252 (b)
\(^{7}\) 40 CFR 60.252 (c)
\(^{8}\) 40 CFR 60.253 (a)(1)
\(^{9}\) 40 CFR 60.253 (a)(2) and 60.253(b)
3.5.1 Process Instrumentation

Instrumentation in the coal preparation plant is relatively simple in comparison with instrumentation at other process industries. The instruments generally found on coal preparation equipment are described below.

Conveyor

The conveyors are driven by electric motors; the current drawn by the conveyor motors varies directly with the conveyor load. The ammeters located in the control room indicate the instantaneous current drawn by the conveyor motors. When excessive current is indicated, conveyor and equipment loading should be investigated.

Some conveyors are also equipped with load meters. These meters indicate the percent of rated load carried by the conveyor at a particular instant. Ammeters and load meters give basically similar indications.

Crushers

The crusher load is directly proportional to the feed rate and feed sizes. The crusher is driven by an electric motor. The ammeter for the motor is generally located in the central control room. Indication of excessive current should be investigated to determine the cause.

Screens

In addition to the load-current ammeters, the screens may be equipped with pressure gauges indicating the pressure of water to the sprays. The various correct combinations of load current and spray pressure should be established during performance tests for reference during periodic inspections. The increase in load current would mean increased screen loading; this should be matched by increased spray water, which will be indicated by the pressure gauge.

Air Tables

In general, the new air table installations will be equipped with instruments to indicate the load current, pressure drop across the air table, and pressure drop across the control equipment. The load current is indicated by the ammeter; pressure drops are indicated by the pressure gauges. These instruments can be located in a central control room. The correct combinations of these parameters should be established during performance tests for future reference.

An excessive pressure drop across the air table means a higher percentage of fine coal in the table feed. This will also result in an increased load on the control device. The pressure drop across the control device should be matched to meet the increased particulate loading.

Thermal Dryers

Thermal dryers are equipped with instruments to indicate the feed rate and exit gas temperature. The exit gas temperature is continuously recorded and monitored. In the case of
thermal dryers with venturi scrubbers, scrubber water supply pressure and pressure loss in the venturi constriction are also continuously monitored. The monitoring aspects are discussed under records in Section 3.5.2.

The thermal dryer feed rate indicates the quantitative loading; however, this may not be useful for predicting the emissions. Emissions from the thermal dryer would depend on the moisture and fine-coal percentage of the feed.

3.5.2 Records

The NSPS require the continuous monitoring of the flue gas temperature at the exit of the thermal dryer, pressure of the water supply to the venturi scrubber, and pressure loss in the venturi constriction. A record of these parameters must be available at the plant for inspection.

Other records, though not required under the NSPS, showing the plant feed rates and equipment malfunction and shutdown should be inspected to determine the plant’s emissions between inspections.

3.6 Start-up, Shutdown, and Malfunctions

Emissions that occur during normal plant start-ups and shutdowns are exempted by the NSPS. The following sections discuss the possible causes of extended emission upsets and precautionary measures for preventing them. The primary emission sources are the air table and the thermal dryer, and, in some cases of malfunctions, their control devices. The secondary emission sources are more numerous, less susceptible to upset, and more easily corrected. These sources are screens, breakers, crushers, conveyor transfer points, storage bins, loading and unloading stations, and supporting equipment. In this section, a brief discussion of emissions during plant start-up and shutdown is followed by an analysis of malfunctions that can occur in regular plant operation.

3.6.1 Start-up and Shutdown

A normal interruption during a shift, such as that caused by car changes, lack of coal, or mechanical failure of equipment, usually does not cause an emission upset because the plant is kept running. The heat of the thermal dryer is regulated, and the other emission sources will receive no coal to create dust. Upon resumption of coal flow, the first coal encounters normal conditions.

In start-up at the beginning of a shift or after a long breakdown, the period of adjustment is short, lasting only until the flow of coal through the plant is complete. In the starting sequence, each unit (or several) is brought online at a time interval. The normal procedure, on automatic starting, would energize all water pumps, air compressors, and related dust control equipment before coal is received. The thermal dryer should be up to temperature, and all sprays should be operational. At a well-designed plant, this sequence is interlocked, without recourse to bypass.

Some plants are built with selected interlocks; these arrangements permit utilization of only certain sections of the plant or operation around nonfunctional equipment. Manual controls to allow bypassing of interlocks are common. Improper use of bypass features is the most probable reason for an emission upset during start-up of a plant with interlocks.

The shutdown procedure for some plants is automatically executed in the reverse of start-up, with some variations. This permits the plant to “empty” itself; more commonly, the “stop” sequence is timed to a shorter period than is required for traverse of the process circuit. In either event, the dust
control equipment should be timed to continue operation after the coal feed is stopped, for a period long enough to allow the equipment to run clean.

The coal preparation incorporates an emergency “stop” button which halts all equipment instantly. This procedure entails no particular ill effects, since everything (including the thermal dryer) stops operating. However, if the incoming coal is near the capacity of the circuits and a buildup of dust has occurred in critical spots, a short emission upset may occur on start-up.

**Air Table**

The air table is most adversely affected by a sharp change in size distribution of the incoming coal to include greater amounts of extreme fines. This shift permits overloading of the dust control equipment. Simple overloading of the air table, which produces a similar condition, is caused by malfunction of the proportioning feeder on the air table or by desire of the operator to increase production. Air seals on the table, if not properly maintained, will become serious sources of fugitive dust emissions.

**Thermal Dryers**

The thermal dryer, like the air table, is subject to particulate emission standards. Overheating of a thermal dryer may be caused by failure of a regulating valve (gas or oil fired) or other control and usually will produce an “upset” plume. The “internals” of dryers involve mechanical (sometimes moving) parts, which are subject to wear and damage. The refractory lining also is subject to scheduled replacement.

The second section of a thermal dryer is a large diameter cyclone, used to extract the particulate matter larger that 300 micrograms/m³ from the gas stream. This cyclone has no internal working parts, but the refractory lining is subject to wear. Volume of air, temperature, and pressure drop are the chief criteria for satisfactory or normal cyclone operation. Other causes of emissions are mechanical failure of the discharge feeder and wearing of seals.

The last section of a thermal dryer is a scrubber, used to remove the fine portion of coal (300 micrograms/m³ × 0) from the air stream. The scrubber may incorporate a bypass for emergency use, which may be partially open and permit particulate emission. The inspector should examine the bypass during each plant inspection and should examine records of bypass use.

The venturi scrubber is the type most commonly used. Its efficiency is a function of the volume, pressure drop, and temperature of the contaminated air and the volume and pressure of the scrubbing medium (water). Deviation from established norms can be checked by reference to records of previous plant inspections.

The inspector should examine the seals at manholes and duct collars for tight fit and should check the device for removal of solids and spent scrubbing liquids to ensure that it is not blocked partially open. With a “variable venturi” type scrubber, the inspector must be provided with a record of the “normal” setting. Water is introduced internally through a nozzle or sprays, which, if blocked or inoperative could affect a zone of the venturi adversely.

The moisture separators and/or demisters of a scrubber installation may become blocked, or partially so, particularly if they include a screen. Particular attention should be given to “ball-bed”, “packed tower”, and “packed bed” types of scrubbers, which incorporate a supplemental internal feature that may become blocked or cause resistance to the flow of gas or liquid.
screens

Fugitive emissions occur at the screens when fine coal is involved. The coal preparation plants generally use three types of screens: grizzly, shaker, and vibrating. Grizzly screens are used on ROM coal preceding a crusher or loading a belt conveyor. They usually are served by sprays, but are sometimes enclosed. The doors, plates, and seals of the enclosure are highly subject to damage by pieces of metal or rock. Wet, incoming material may cause plugging of the branch air duct from the enclosure to the dust collector, which should be sized to carry dust-laden air, at the minimum pressure available, at a velocity of not less than 4500 fpm.

Shaker screens are used infrequently, rarely providing a separation less than two inches (usually much larger). A hooded enclosure may be found alongside the screen. Principal malfunctions involve plugging, short-circuiting, or improper sizing of the conveying ducts, damage to the hood, or improper placement of the hood.

A vibrating screen is the most common separating device. Many screens are flooded with water and constitute no dust source. The “dry” screens usually make a separation at 1/4-3/8-1/2 inch and create fugitive dust. Malfunctions involve loose seals, damaged enclosures, open access doors, and blocked or short-circuited air ducts.

Crushers

Crushers, an important source of fugitive dust, are protected by sprays or dust collectors. A sudden appearance of fugitive dust may be caused by blockage or short-circuiting of air ducts, broken enclosures or seals, or open access doors. If operation of the crusher is changed, an upset may occur. A hammermill will respond to higher speeds with finer product and/or greater capacity, creating a new situation for dust control. Introduction of a coal of soft consistency can also introduce new problems.

Breakers are subject to the same types of malfunctions described for crushers, caused by broken, loose, or misplaced enclosures, blocked or short-circuited air ducts, open access doors, and overloading. Similarly, change of perforated plates to reduce the sizing or introduction of coal from different seams can cause fugitive dust emissions.

Conveyor Transfer Points

Conveyor transfer points are sources of fugitive dust when dry coal containing the 3/8 × 0 inch increment is processed. If the material is larger than 3/8 inch or surface moisture content exceeds about nine percent, dust emissions do not occur. The enclosure usually has no access door, which may be removed or left open, thus short-circuiting the “pickup” air. Rubber seals or curtains also may be removed or damaged. Airflow may be insufficient to gather the dust. The duct carrying the dust-laden air away may be blocked, broken, or poorly sized. A damper may be in the wrong position, or the chute leading from the conveyor pulley may be blocked, permitting spillage. The duct should carry the volume of air at a velocity of 4500 fpm. Proper conveying pressure may be unavailable because of malfunction or overloading of the collecting device at the duct terminal. Speeding or overloading of a conveyor may cause an emission upset at the terminal. Reference to earlier inspection reports will disclose any deviation from the normal flow of coal at a given point. Most of the malfunctions described above are readily handled by maintenance and replacement of
damaged components.

Storage Facilities

Storage bins or silos include several possible fugitive dust sources. The feeder underneath a bin may be enclosed in a structure similar to that at a belt conveyor transfer point just described, and the same malfunctions may occur.

Most storage bins and silos are covered and are loaded by the conveyor. The conveyor discharge has been discussed, but a supplemental bin exhaust should be present to equalize pressure inside against the volume of incoming coal. This port is sometimes equipped with a bin vent filter, which can become plugged because of infrequent filter changes or exposure to water. The bin may also have ducts leading from these vents to a central dust collector. The bin should be exhausted at an air volume rate equal to twice the volume of incoming coal. Emissions may occur if this amount of air is not provided or if the lines from the bin are inadequate, as discussed with respect to conveyors.

A third possible emission source is present on a few silos, usually storing ROM, which have large openings through the walls near the top and around the circumference at spaced intervals. These openings may have doors, which are normally closed to contain the coal within the silo. Coal is released upon operator demand or when the silos become nearly full, flowing through the holes to open storage around the silo. This operation can produce substantial fugitive dust emissions.

Loading and Unloading Stations

The points at which outgoing coal is loaded and incoming coal is received constitute significant sources of fugitive dust emissions because of the large volumes of coal that are handled, often without adequate controls. The chutes, hoods, bins and miscellaneous full or partial enclosures involved in unloading and loading operations are subject to the same malfunctions described earlier with respect to similar equipment elsewhere in the plant: passages are blocked or plugged, access doors are removed or left ajar, seals are broken or faulty, metal components are dented, corroded, or otherwise deteriorated. Essentially simple structures or devices may be inoperable because of damage that is undetected or ignored. The task of the inspector is to note and record all actual or possible points of dust emission regarding the attention of plant operators. Certain points of the coal transfer operations, however, are worthy of special note.

Unloading from railroad cars may involve the use of retractable chutes, operated pneumatically, which often lose precision because of wear or erratic power supply. Conventional loading of railroad cars is sometimes protected by oil spraying, the effectiveness of which may be deteriorated by broken or plugged sprays and lines, damaged pumps or tanks, erratic pressure control valves, and insufficient oil supply. Barge loading is by chute, retractable to a degree, but still permitting free fall of the coal into the barges. In stockpile loading by conveyor, coal is discharged from a conveyor high in the air and falls either through retractable chutes or loading stacks. Loading stacks are hollow, stationary columns, either of steel or concrete, reaching from the ground to the belt conveyor discharge. They have staggered partial openings at different elevations, extending the entire length, to offer some protection from the wind and to permit accumulation of the stockpile around the exterior. If the closures are blocked in an open position, adverse air currents may be generated.

In all of the loading operations, windbreaks are essential for control of air currents. These should be well placed with respect to prevailing winds, and must be well maintained for maximum
effectiveness. The dust emission problems involved at stations for unloading of the ROM coal naturally are similar to those at loading points.

Truck dump bins are sometimes partially enclosed. Sheeting may be absent from these enclosures, either deliberately or by accident. Many such bins have no dust control system. Any hooded dust control must allow for very high airflow because of the high rate at which the air in the bin is exhausted.

Stations for unloading of railroad cars are normally housed, and the fugitive dust-collecting hoods are subject to the malfunctions described earlier.

3.6.2 Malfunction of Control Devices

Malfunctions of control devices principally involve scrubbers, cyclones, sprays, baghouses, and dust control collection systems. Scrubbers have been discussed in connection with thermal dryers.

A cyclone can be installed to operate on predetermined volumes of particulate-bearing air at any given temperature limits, with a minimum stipulated recovery of particles in the various size ranges. Recovery is determined by the shape of the cyclone and the volume flow through it. This is true of all cyclones, whether single or in clusters, large or small, hot or cold.

Detecting the cause of a malfunction will involve isolating the circumstance that has changed since normal operation was recorded.

Air volume can be measured at the outlet of the cyclone. It may be low if the fan is worn, belts are loose or broken, or intake area is no longer sufficient to pass adequate air at the pressure available. Blockage anywhere in the system is equally damaging.

Temperature can be measured at the cyclone inlet. If it deviates from the design limits, the volume of air at a given pressure will be incorrect. Temperature variations of these proportions would probably reflect the introduction of heated air.

Determining pressure drop “across the cyclone” requires pressure readings before and after the device. Common problems are a worn vacuum pump, loose belts, and an opening in the duct following the cyclone. If the pressure is constant at the fan, the pressure has increased downstream from the cyclone or an accident has occurred within the cyclone.

The shape of the cyclone can be changed by large dents, fallout of the refractory liner, mechanical failure of the feeder discharging solids at the bottom, and by blockage due to accumulation of fire clay or wet fine coal on the interior walls. In a wet-wall cyclone, the flow of liquid down the interior walls may be inadequate to reach the bottom, causing buildup on the interior. In cyclone clusters, partial blockage of any of the several small units can reduce the flow of air. As with many of the processing components, a change in analysis of incoming coal can cause difficulty.

Spray systems in a coal preparation plant can range from low-pressure “fish tails” or hollow-nozzle types to high-pressure (300 psi) impingement types. A wetting agent is occasionally used in the spray water. Appearance of excessive particulate probably may be traced to one of the following causes:

- Introduction of more than normal amounts of dust
- Misalignment, damage, or plugging of spray heads or header
- Damage of a control valve
- Plugging of a line filter or incoming line
- Wear or damage of pump or drive
- Lack of water
- Damage of sensor device or on-off switch
- Accumulations of ice in lines or spray heads

The criteria for successful operation of fabric filters are pressure drop across the baghouse, temperature of the incoming air, and the volume of air per surface area of filter fabric. Other possible causes of fugitive dust emissions include the usual factors involving wear, damage, looseness, plugging, or other impediments to effective operation of fans, blowers, ducting, hoppers, and similar components. In addition, the inspector may check for the following:

- New bags pass fine particulate until they become permeated and coated. If new fabric is used, it may not be compatible with the air velocity, temperature, or pH count of the stream
- Interior diaphragms may be punctured or loose
- Cleaning cycles may remove too many bags from the circuit, leaving an inadequate number in operation. This is most likely to occur just before planned maintenance, when a number of bags are tied off
- The collecting hopper below the bags may be filled with dust. Foreign materials (bags, hose, tools) sometimes enter the hopper and cause blockage
- Bag cleaning may be neglected in manual operation, or the rapping or shaking mechanisms may suffer mechanical failure; reverse air jet (pneumatic) systems or timing devices may fail or become plugged
- Bypassing devices may become damaged, partially or completely blocked, or out of cycle

Systems for collection of dust from various sources throughout the plant are made up of hoods and enclosures at emission points, with ducts leading to junctures and finally to a major duct to the collecting device, usually a baghouse. Each of the branch lines or ducts must be properly sized to maintain adequate flow. Air intakes or cleanouts located at critical points are equipped with dampers (valves), which can cause malfunction. Connection of branch lines to larger ones must not be sharp (45°, preferably 30°) and should enter from the top or sides, never opposing. Any bend in the ducting should have an inside radius of two times the pipe diameter. Introduction of water into the duct collection system is another source of potential trouble.
3.7 Emission Performance Tests

The emission performance tests are intended to serve as a basis for determining compliance status of the plant during subsequent inspections. These initial performance tests, therefore, must be conducted under conditions that are representative of plant operation. Two factors are of paramount importance: 1) the coal being cleaned, and 2) the equipment loadings during the test. Analysis of the coal processed in the test should be typical with respect to percentage of fines and moisture content. Similarly, equipment loadings, which usually will differ from the rated or design capacities, should represent the maximum continuous loading in plant operation. As discussed in the balance of this section, the inspector will work with the plant officials and the emissions testing contractor in selection of process parameters for the emissions test.

3.7.1 Test Monitoring

It is important to remember that the initial emissions tests determine the reliability of later emission compliance inspections and tests. All persons involved in the emissions tests should seek to ensure that the tests are conducted fairly and the test results are valid.

The inspector plays a major role in monitoring the test procedures and plant operating parameters during the test period. He must ensure that the tests are carried out according to standard procedures.

The following are key factors to be monitored continuously during the tests:

- Plant feed rate
- Percentage of fines and moisture content of the feed
- Air table feed rate and baghouse pressure
- Thermal dryer feed rate and exit gas temperature
- Durations and intervals of emissions tests

Appendix A presents detailed inspection checklists to aid the inspector in performing his duties. At least three sets of process observations are recommended. The number of stack test observations during emission performance tests will depend on the mutual agreement of the inspector, plant operators, and test contractor; for each set of stack test data, corresponding process data should be recorded. A separate copy of the checklist for each set of observations will facilitate the comparison of observations.

3.8 Periodic Compliance Inspections

Periodic inspections following the emissions performance tests will enable the inspector to determine the current compliance status of the plant. The inspection mainly involves comparison of current plant operations with those recorded during the emissions tests. The plant instrumentation and records constitute the major information source for the inspector. In addition, he will use the
3.8.1 Performing the Periodic Inspection

The periodic inspection generally involves the following steps:

- Obtain schedule of plant operations during the proposed inspection period
- Study all available plant data including details of the performance test, emission points, and control equipment
- Study instrumentation data gathered in performance tests
- Note unusual characteristics of the plant, and comments made by previous inspectors
- Inform plant officials of the proposed inspection and ensure that records are current and available for inspection

Major emphasis of the inspection is on checking facility records and observing the operation of process and control equipment, including instrumentation. The following procedures should be performed in the order shown whenever possible. The suggested format enables the inspector to tour the plant, observe the process, and monitor the instruments during operation.

Observations Outside the Plant

- Note plume opacity
- Check whether weighing devices are properly operating

Observations Inside the Plant

- Use periodic inspection checklist (Appendix B) for recording process parameters and control equipment data
- Plant records of thermal dryer exit temperature, water supply to the scrubber, and pressure loss in the scrubber provide information on operations during the period between inspections. The inspector should be satisfied that the records are accurate and should not hesitate to ask for further information

3.8.2 Determining Compliance Status

Compliance status of the plant is determined chiefly by comparing the inspection observations with those obtained during performance tests and previous inspections. Although such comparisons do not allow the prediction of quantitative emission rates, they do serve to indicate any emission upsets. Understanding the significance of each item in the checklist allows the inspector to weigh the effects of each item on process emissions. The relationships of checklist items with process emissions are presented in Appendix B.
emissions are discussed below.

Coal Data

The coal moisture content and percentage of fine coal (-1/4 inch) determine the loadings of the thermal dryer and air tables. Higher percentages of fine coal in the feed tend to increase thermal dryer emissions. Higher moisture content also increases the thermal dryer loading. If the feed analysis differs significantly from those recorded earlier, further investigation should be made.

Feed Rate

In general, the feed rates during periodic inspections should not be higher than those observed during performance tests. An increase in feed rate increases the loading of processing equipment. Normal feed variations up to ten percent may not significantly affect the emissions. An increase in feed rates should be compensated for by additional controls, such as higher flow rates for sprays and higher pressure drop across the venturi. Any increase in feed rates higher than ten percent should be questioned.

Load Current

The preparation equipment generally includes ammeters that indicate the load current. Load current values should be compared with those observed during performance tests. Overloading of equipment will be indicated by the increase in demand of load current.

Fugitive Dust Opacity

NSPS regulations specify the opacity limits for fugitive dust emissions. Opacity readings according to Method 9 should be taken to determine the fugitive dust emission compliance.
APPENDIX A. CHECKLIST FOR PERFORMANCE TEST

GENERAL INFORMATION

BASELINE DATA

Plant Name:_______________________________________________________________

Plant Address:_____________________________________________________________

Contact at Plant:___________________________________________________________

Date of Inspection:________________________________________________________

Inspected by:_______________________________________________________________

Plant Rated Feed Capacity, ton/hr:____________________________________________

Plant Feed Rate, ton/hr:_______________________________________________________

Year of Plant Commissioning/
Major Modification:_________________________________________________________

Facility Data: Cleaning Techniques
☐ Wet
☐ Dry
☐ Other___________________________

Number of Point Sources:_____________________________________________________

Fugitive Particulate Emission Control Plan (Regulation No. 1) ☐ Yes ☐ No

Compliance Plan ☐ Yes ☐ No

Subject to NSPS Subpart Y ☐ Yes ☐ No
## COAL DATA

**COAL SEAM:**
1. __________________________
2. __________________________
3. __________________________

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<tr>
<td><strong>Conventional mining,</strong></td>
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Is there a stockpile size limit?  ☐ Yes ________ acres  
☐ No

Last Revised: June 22, 1998
EQUIPMENT CHECKLIST

WEIGHING DEVICE:

☐ Available   ☐ Not available

Type:___________________________________________________________

Scale design capacity:____________________________________________

Size of coal weighed:          ☐ ROM         ☐ 1/4 x 0
                               ☐ Other_____________________________

Last date of calibration:____________________________________________

Prescribed calibration frequency:_____________________________________

PLANT HOURLY FEED RATE DURING INSPECTION , TON/HR.

<table>
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</table>

Average hourly feed rate, ton/hr.__________________________________________

Maximum hourly feed rate, ton/hr:__________________________________________

PRIMARY CRUSHER/CRUSHER ENCLOSURE:

Feed rate:_________________________________ ton/hr

Feed Capacity:_________________________________ ton/hr

Load current:_________________________________ amperes

Fugitive dust control:     ☐ Good     ☐ Poor
Control Type: □ Spray  Water Feed Rate: __________
□ Cyclone  Pressure Drop: __________
Manufacturer’s recommended pressure drop range __________
□ Fab. Filter  Pressure Drop: __________
Manufacturer’s recommended pressure drop range __________

Opacity of Emissions: Fugitive _____%
Control Equipment Stack _____%

SECONDARY CRUSHER:

Feed rate: ___________________________ ton/hr
Feed Capacity: _________________________ ton/hr
Load current: __________________________ amperes

Fugitive dust control: □ Good □ Poor

Control Type: □ Spray  Water Feed Rate: __________
□ Cyclone  Pressure Drop: __________
Manufacturer’s recommended pressure drop range __________
□ Fab. Filter  Pressure Drop: __________
Manufacturer’s recommended pressure drop range __________

Opacity of Emissions: Fugitive _____%
Control Equipment Stack _____%

AIR TABLES:

<table>
<thead>
<tr>
<th>TABLE NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>Baghouse ΔP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baghouse manufacturer’s recommended ΔP range</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Current, amperes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclone ΔP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclone manufacturer’s recommended ΔP range</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stack gas opacity, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed rate, t/hr</td>
<td></td>
<td></td>
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</tbody>
</table>

Last Revised: June 22, 1998
SCREEN/ENCLOSURES:

<table>
<thead>
<tr>
<th>SCREEN NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed rate, ton/hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture content, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product sizes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fugitive dust control:

- Type: Spray (water feed rate) [ ]
- Cyclone ($\Delta P$) [ ]
- Fab. Filter ($\Delta P$) [ ]
- Manufacturer’s recommended $\Delta P$

Fugitive % Opacity

Stack % Opacity

THERMAL DRYER:

Type______________________________________Btu Rating___________________

Dryer feed rate:______________________________ton/hr
Dryer feed size:______________________________ton/hr
Feed moisture content:______________________%
Product moisture content:___________________%
Fan load current:____________________________amperes
Fan suction $P$:_________________________in, vac.
Drying chamber $P$_________________________in, vac.

Flue gas temperature at dryer exit: normal___ °F
(For last 12 hrs. of operation) maximum___ °F minimum___ °F
Last date of temperature recorder calibration:_____________

Cyclone outlet temperature:______________________ F
Cyclone $\Delta P$:_________________________in. W.C.
Manufacturer’s recommended $\Delta P$ range_________ in. W.C.

FLUE GAS SCRUBBER:

- Scrubber water pressure
  - Normal________psi
  - (last 12 hrs. of operation) Maximum________psi
  - Minimum________psi
  - Last date of water pressure gauge calibration:________________________

Last Revised: June 22, 1998
Pressure drop at scrubber
Normal__________in. W.C.
(last 12 hrs of operation) Maximum__________in. W.C.
Minimum__________in. W.C.
Manufacturer’s recommended pressure drop range:__________________
Last date of pressure drop gauge calibration:________________________

Opacity of flue gas at stack exit, %_____________________________

CONVEYOR/TRANSFER POINTS:

<table>
<thead>
<tr>
<th>CONVEYOR NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiving unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge conveyor speed, ft./min.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated capacity, ton/hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type: Spray (water feed rate) □</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclone (∆P) □</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fab. Filter (∆P) □</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer’s recommended ∆P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stack % Opacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fugitive % Opacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LOADING STATION:

Type: □ Truck □ Railroad □ Barge
□ Unit Train □ Other__________________________

Feed capacity:_____________________________ton/hr
Actual feed rate:_____________________________ton/hr

Extent of dust control: □ Good □ Poor

Fan load current:_______________________amperes

Fugitive dust control: □ Good □ Poor

Control Type: □ Spray
       □ Cyclone Water Feed Rate:___________
       □ Cyclone Pressure Drop: ____________
Manufacturer’s recommended pressure drop range ___________
□ Fab. Filter  Pressure Drop: _____________
Manufacturer’s recommended pressure drop range __________

Opacity of Emissions:  Fugitive _____%
Control Equipment Stack _____%

UNLOADING STATION:

Type:  □ Truck  □ Barge  □ Railroad

Feed capacity:____________________ton/hr
Actual feed rate:___________________ton/hr

Fugitive dust control:  □ Good  □ Poor

Control Type:  □ Spray  Water Feed Rate:__________
□ Cyclone  Pressure Drop: _____________
Manufacturer’s recommended pressure drop range __________
□ Fab. Filter  Pressure Drop: _____________
Manufacturer’s recommended pressure drop range __________

Opacity of Emissions:  Fugitive _____%
Control Equipment Stack _____%

COAL STORAGE:

Type:  □ Silo  □ Fabricated Bin

Location:____________________________________________________
Size of coal stored:__________________________________________

Type of coal stored:_______Raw coal_______Washed coal

Fugitive dust control:  □ Good  □ Poor

Storage design feed rate____________ton/hr
Actual feed rate___________________ton/hr

Control Type:  □ Spray  Water Feed Rate:__________
□ Cyclone  Pressure Drop: _____________
Manufacturer’s recommended pressure drop range __________
□ Fab. Filter  Pressure Drop: _____________
Manufacturer’s recommended pressure drop range __________

Opacity of Emissions:  Fugitive _____%
SUMMARY OF SUBPART Y REQUIREMENTS:

- **Thermal Dryer 60.252 (a)**
  A. 0.031 gr/dscf Particulate Matter Standard 60.252 (a)(1)
  B. 20% Opacity Standard 60.252 (a)(2)
  C. Continually measure exhaust gas stream temperature. 60.253 (a)(1)
  D. Recalibrate temperature measuring device annually. 60.253 (b)

- **Pneumatic Coal Cleaning Equipment (Air Tables) 60.252 (b)**
  A. 0.018 gr/dscf Particulate Matter Standard 60.252 (b)(1)
  B. 10% Opacity Standard 60.252 (b)(2)

- **Venturi Scrubber**
  A. Continually measure pressure drop across venturi constriction. 60.253 (a)(2)(I)
  B. Continually measure water supply pressure to the scrubber. 60.253 (a)(2)(ii)
  C. Recalibrate pressure drop and water pressure measuring device annually. 60.253 (b)

- **Coal Processing and Conveying Equipment, Coal Storage System, and Coal Transfer and Loading System Processing Coal**
  A. 20% Opacity Standard 60.252 (c)
# APPENDIX B. CHECKLIST FOR PERIODIC INSPECTION

## GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Plant Name:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Name:</td>
<td></td>
</tr>
<tr>
<td>Plant Address:</td>
<td></td>
</tr>
<tr>
<td>Contact at Plant:</td>
<td></td>
</tr>
<tr>
<td>Date of inspection:</td>
<td></td>
</tr>
<tr>
<td>Plant Rated Feed Capacity, ton/hr:</td>
<td></td>
</tr>
<tr>
<td>Plant Feed Rate, ton/hr:</td>
<td></td>
</tr>
<tr>
<td>Year of Plant Commissioning/Major Modification:</td>
<td></td>
</tr>
</tbody>
</table>

### Facility Date: Cleaning Techniques

- [ ] Wet
- [ ] Dry
- [ ] Other ________________

### Number of Point Sources: ________________

### Fugitive Particulate Emission Control Plan (Regulation No. 1)

- [ ] Yes
- [ ] No

**IF Yes,** any increase in daily or annual production requires resubmittal of Control Plan.

### Compliance Plan

- [ ] Yes
- [ ] No

### Subject to NSPS Subpart Y

- [ ] Yes
- [ ] No
## COAL DATA

**COAL SEAM:**

1. _______________________
2. _______________________
3. _______________________

<table>
<thead>
<tr>
<th></th>
<th>Raw coal as received</th>
<th>Refuse coal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Surface moisture, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1/4 x 0, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ash, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Strip mining, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Continuous mining, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Conventional mining, %</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is there a stockpile size limit?    □ Yes ________ acres
□ No
EQUIPMENT CHECKLIST

WEIGHING DEVICE:

☐ Available       ☐ Not Available

Type: ________________________________________________________________

Scale design capacity: ________________________________________________

Size of coal weighed:       ☐ ROM       ☐ 1/4 x 0
                         ☐ other__________________________________

Last date of calibration: ______________________________________________

Prescribed calibration frequency:______________________________________

PLANT HOURLY FEED RATE DURING INSPECTION, TON/HR.

<table>
<thead>
<tr>
<th>1st hour</th>
<th>2nd hour</th>
<th>3rd hour</th>
<th>4th hour</th>
<th>5th hour</th>
<th>6th hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Average hourly feed rate, ton/hr:______________________________________

Maximum hourly feed rate, ton/hr:______________________________________

PRIMARY CRUSHER/CRUSHER ENCLOSURE:

Feed rate:_______________________ ton/hr
Feed capacity:_____________________ ton/hr
Load current:______________________ ton/hr

Fugitive dust control:       ☐ Good       ☐ Poor
Control Type\(^{10}\):  
- □ Spray  
- □ Cyclone  
- □ Fab. Filter  

- Water Feed Rate:\__________
- Pressure Drop:\__________
- Manufacturer’s recommended pressure drop:\__________

- Pressure Drop:\__________
- Manufacturer’s recommended pressure drop:\__________

Followed indicator dye test freq.:  
- □ Yes  
- □ No

Opacity of Emissions:  
- Fugitive:\__________%
- Control Equipment Stack:\__________%

SECONDARY CRUSHER:

Feed rate:\__________ ton/hr
Feed capacity:\__________ ton/hr
Load Current:\__________ amperes

Fugitive dust control:  
- □ Good  
- □ Poor

Control Type\(^{11}\):  
- □ Spray  
- □ Cyclone  
- □ Fab. Filter  

- Water Feed Rate:\__________
- Pressure Drop:\__________
- Manufacturer’s recommended pressure drop:\__________

- Pressure Drop:\__________
- Manufacturer’s recommended pressure drop:\__________

Followed indicator dye test freq.:  
- □ Yes  
- □ No

Opacity of Emissions:  
- Fugitive:\__________%
- Control Equipment Stack:\__________%

AIR TABLE \(^{11}\):

<table>
<thead>
<tr>
<th>TABLE NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>Baghouse $\Delta P$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baghouse manufacturer’s recommended $\Delta P$ range</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Current, amperes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclone $\Delta P$</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cyclone manufacturer’s recommended $\Delta P$ range</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^{10}\) Compare to baseline data and previous inspections

\(^{11}\) Compare to baseline data and previous inspections

Last Revised: June 22, 1998
| Stack gas opacity, % |  |  |  |  |
| Feed rate, t/hr |  |  |  |  |

Followed prescribed baghouse indicator dye test freq.: □ Yes □ No
Particulate concentration at exit (from stack test), gr/dscf: ________________
*If opacity increases, source may be over gr/dscf.

**SCREENS/ENCLOSURES** 

<table>
<thead>
<tr>
<th>SCREEN NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed rate, ton/hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture content, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product sizes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fugitive dust control:
- Type: Spray (water feed rate) □
- Cyclone (△P) □
- Fab. Filter (△P) □
- Manufacturer’s Recommended △P

Fugitive % Opacity: ________________
Stack % Opacity: ________________

Followed prescribed baghouse indicator dye test freq.: □ Yes □ No

**THERMAL DRYER:**

- Type: ____________________________ Btu Rating: ________________
- Dryer feed rate: ____________________________ ton/hr
- Dryer feed size: ____________________________ ton/hr
- Feed moisture content: ____________________________ %
- Product moisture content: ____________________________ %
- Fan load current: ____________________________ amperes
- Fan suction P: ____________________________ in, vac.
- Drying chamber P: ____________________________ in, vac.

Flue gas temperature at dryer exit: normal __________ °F
(For last 12 hrs. of operation) maximum __________ °F minimum __________ °F
Last date of temperature recorder calibration: ________________

---

12 Compare to baseline data and previous inspections

Last Revised: June 22, 1998 47
Cyclone outlet temperature\textsuperscript{12}: _____________________ F
Cyclone $\Delta P$\textsuperscript{12}: _____________________ in. W.C.
Manufacturer’s recommended $\Delta P$ range: _______________ in. W.C.

Particulate concentration at exit (from stack test), gr/dscf: __________________________

*If opacity increases, source may be over gr/dscf.

**FLUE GAS SCRUBBER:**

- Scrubber water pressure\textsuperscript{13}
  - Normal: _______________ psi (last 12 hrs. of operation)
  - Maximum: _______________ psi
  - Minimum: _______________ psi
  - Last date of water pressure gauge calibration: __________________________

- Pressure drop at scrubber\textsuperscript{13}
  - Normal: _______________ in. W.C. (last 12 hrs of operation)
  - Maximum: _______________ in. W.C.
  - Minimum: _______________ in. W.C.
  - Manufacturer’s recommended pressure drop range: __________________________
  - Last date of pressure drop gauge calibration: __________________________

- Opacity of flue gas at stack exit\textsuperscript{13}, %: __________________________

**CONVEYOR/TRANSFER POINTS:**

<table>
<thead>
<tr>
<th>CONVEYOR NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiving unit</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Discharge conveyor speed, ft./min.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated capacity, ton/hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Type\textsuperscript{13}: Spray (water feed rate) ☐
  - Cyclone ($\Delta P$) ☐
  - Fab. Filter ($\Delta P$) ☐
- Manufacturer’s recommended $\Delta P$ range

- Stack % Opacity\textsuperscript{13}

- Fugitive % Opacity

Followed prescribed baghouse indicator dye test freq.: ☐ Yes ☐ No

\textsuperscript{13} Compare to baseline data and previous inspections
LOADING STATION:

Type:  □ Truck       □ Railroad       □ Barge
       □ Unit Train       □ Other_____________________________

Feed capacity:________________________________________ton/hr.
Actual feed rate:________________________________________ton/hr.

Extent of dust control:  □ Good       □ Poor

Fan load Current:\______amperes

Control Type:\________________________
□ Spray       Water Feed Rate:______________
□ Cyclone     Pressure Drop: ______________
                   Manufacturer’s recommended pressure drop__________
□ Fab. Filter Pressure Drop: ___________
                   Manufacturer’s recommended pressure drop__________
                   Followed prescribed baghouse indicator dye test freq.
                   □ Yes  □ No

Opacity of Emissions:  Fugitive ______%
                      Control Equipment Stack\______%  

UNLOADING STATION:

Type:  □ Truck       □ Barge       □ Railroad

Feed Capacity:________________________________________ton/hr
Actual feed rate:________________________________________ton/hr

Fugitive dust control:  □ Good       □ Poor

Control Type:________________________
□ Spray       Water Feed Rate:______________
□ Cyclone     Pressure Drop: ______________
                   Manufacturer’s recommended pressure drop__________
□ Fab. Filter Pressure Drop: ___________
                   Manufacturer’s recommended pressure drop__________
                   Followed prescribed baghouse indicator dye test freq.
                   □ Yes  □ No

Opacity of Emissions:  Fugitive ______%
                      Control Equipment Stack\______%  

\______ Compare to baseline data and previous inspections
**COAL STORAGE:**

| Type: □ Silo       □ Fabricated Bin |
|-------------------|---------------------------------|

<table>
<thead>
<tr>
<th>Location: ________________________________</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Size of coal stored: ____________________</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type of coal stored: ______ Raw coal ______ Washed coal</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Fugitive dust control: □ Good □ Poor</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Storage design feed rate ____________ ton/hr</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Actual feed rate ________________ ton/hr</th>
</tr>
</thead>
</table>

| Control Type¹⁵: □ Spray Water Feed Rate: ____________ |
|----------------|----------------------------------|
| □ Cyclone      | Pressure Drop: ________________ |
|                | Manufacturer’s recommended pressure drop ____________ |

<table>
<thead>
<tr>
<th>□ Fab. Filter</th>
<th>Pressure Drop: ________________</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Manufacturer’s recommended pressure drop ____________</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Date of last indicator dye test: ____________</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Opacity of Emissions: Fugitive _____%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Equipment Stack¹⁵ ______%</td>
</tr>
</tbody>
</table>

¹⁵ Compare to baseline data and previous inspections
NEW SOURCE PERFORMANCE SPECIFICATIONS
40 CFR PART 60, SUBPART Y

SUMMARY OF SUBPART Y REQUIREMENTS:

• Thermal Dryer 60.252 (a)
  A. 0.031 gr/dscf Particulate Matter Standard 60.252 (a)(1)
  B. 20% Opacity Standard 60.252 (a)(2)
  C. Continually measure exhaust gas stream temperature. 60.253 (a)(1)
  D. Recalibrate temperature measuring device annually. 60.253 (b)

• Pneumatic Coal Cleaning Equipment (Air Tables) 60.252 (b)
  A. 0.018 gr/dscf Particulate Matter Standard 60.252 (b)(1)
  B. 10% Opacity Standard 60.252 (b)(2)

• Venturi Scrubber
  A. Continually measure pressure drop across venturi constriction. 60.253 (a)(2)(I)
  B. Continually measure water supply pressure to the scrubber. 60.253 (a)(2)(ii)
  C. Recalibrate pressure drop and water pressure measuring device annually. 60.253 (b)

• Coal Processing and Conveying Equipment, Coal Storage System, and Coal Transfer and Loading System Processing Coal
  A. 20% Opacity Standard 60.252 (c)