Electric Arc Furnaces in the Steel Industry

On October 21, 1974 (39 FR 37466), under section 111 of the Clean Air Act, as amended, the Environmental Protection Agency (EPA) proposed standards of performance for new and modified electric arc furnaces in the steel industry. Interested persons participated in the rulemaking by submitting written comments to EPA. A total of 19 comment letters was received, seven of which came from the industry, eight from State and local air pollution control agencies, and four from Federal agencies. The Freedom of Information Center, Room 2022 West Tower, 401 M Street, S.W., Washington, D.C., has copies of the comment letters received and a summary of the issues and Agency responses available for public inspection during normal business hours. Copies of the issue summary and Agency responses may be obtained upon written request from the EPA Public Information Center, Room 2022 West Tower, 401 M Street, S.W., Washington, D.C. 20460 (specify—Public Comment Summary: Electric Arc Furnaces in the Steel Industry). The comments have been carefully considered, and where determined by the Administrator to be appropriate, changes have been made to the proposed regulation and are incorporated in the regulation promulgated herein.

The bases for the proposed standards are presented in "Background Information for Standards of Performance: Electric Arc Furnaces in the Steel Industry." (EPA-450/2-74-017a, b). Copies of this document are available on request from the Emission Standards and Engineering Division, Environmental Protection Agency, Research Triangle Park, N.C. 27711, Attention: Mr. Don R. Goodwin.

Summary of Regulation

The promulgated standards of performance for new and modified electric arc furnaces in the steel industry limit particulate matter emissions from the control device, from the shop, and from equipment. Emissions from the control device are limited to less than 12 mg/dscm (0.0032 gr/dscf) and percent opacity of emissions escaping capture by the collection system and exiting from the shop are limited to zero percent opacity, but emissions greater than this level are allowed during charging periods and tapping periods. Emissions from the dust-handling equipment are limited to 10 mg/dscm, and monitoring of the pressure inside the electric arc furnace for direct shell evacuation systems is required. Emissions from the control device are from the dust-handling equipment. The promulgated standards of performance for electric arc furnaces reflect the degree of emission reduction achievable and best available control technology for these furnaces. An investigation into the emission reduction achievable and best available control technology for these furnaces will be conducted in the future and standards of performance will be established. Consequently, electric arc furnaces that use continuous feeding of prereduced ore pellets as the primary source of iron are not subject to the requirements of this subpart.

(2) Concentration standard for emissions from the control device. Four commentators recommended revising the concentration standard for the control device to 20 mg/dscm (0.0052 gr/dscf) from the proposed level of 15 mg/dscm (0.0042 gr/dscf). The argument for the higher standard was that the proposed standard had not been demonstrated on existing carbon steel shops or on combination direct shell evacuation-canopy hood control systems. Emission measurement data presented in "Background Information for Standards of Performance: Electric Arc Furnaces in the Steel Industry" show that carbon steel shops as well as alloy steel shops can reduce particulate matter emissions to less than 15 mg/dscm by use of well-designed fabric filter collectors. The data also show that combination direct shell evacuation-canopy hood control systems are limited to 12 mg/dscm. EPA believes that revising the standard to 18 mg/dscm would allow relaxation of the design requirements of the fabric filter collectors which are installed to meet the standard. Accordingly, the standard promulgated herein is 12 mg/dscm.

Two commentators requested that specific concentration and opacity standards be established for emissions from scrubber controlled direct steel shell evacuation systems. The argument for a separate concentration standard was that emissions from scrubber controlled direct steel shell evacuation systems can be reduced to less than 50 mg/dscm (0.022 gr/dscf) and, consequently, several years from extensive use on commercial sized furnaces. Emissions from this type of furnace are generated at different rates and in different amounts than those from emissions from conventionally charged furnaces. The proposed standards were structured for the emission cycle of a conventional charged and electric arc furnace. The standards, consequently, are not suitable for application to electric arc furnaces that use prereduced ore pellets as the primary source of iron. However, the control technology, emissions from these furnaces may not be controllable to the level of all of the standards promulgated herein; however, over the entire cycle the emissions may be less than those from a well-controlled conventional electric arc furnace. Therefore, EPA believes that standards of performance for electric arc furnaces that use prereduced ore pellets require a different structure than do standards for conventionally charged furnaces. An investigation into the emission reduction achievable and best available control technology for these furnaces will be conducted in the future and standards of performance will be established. Consequently, electric arc furnaces that use continuous feeding of prereduced ore pellets as the primary source of iron are not subject to the requirements of this subpart.

EPA would like to emphasize that use of venturi scrubbers to control the effluent from direct steel shell evacuation systems is not considered to be a "best system of emission reduction considering costs." The promulgated standards of performance for electric arc furnaces reflect the degree of emission reduction achievable for systems discharging emissions through fabric filter collectors. EPA believes, however, that the regulation does not preclude use of control systems that discharge the effluent directly without discharging the emissions through venturi scrubbers. Available information indicates that effluent from a direct steel shell evacuation system can be controlled to 0.01 gr/dscf or less using a high energy venturi scrubber (pressure drop greater than 60 in. w.g.). If the scrubber reduces particulate matter emissions to 0.01 gr/dscf, then the fabric filter collector is only required to reduce the emissions from the canopy hood to about 0.004 gr/dscf in order for the emission rates to be less than 0.0052 gr/dscf. Therefore, it is technically feasible for a facility to use a high energy venturi scrubber and a fabric filter to control the combined furnace emissions to less than 0.0003 gr/dscf. A concentration standard of 0.0052 gr/dscf for scrubbers would not require installation of control devices which have a collection efficiency comparable to that of best control technology (well-designed and well-operated fabric filter collection in conjunction with particulate matter control devices which are installed to meet the standard. Accordingly, the standard promulgated herein limits particulate matter emissions from the control device to less than 12 mg/dscm.
when emitted from average diameter stacks. For the reasons discussed above, neither a separate concentration standard nor a separate opacity standard would be established as suggested by the commenters.

(3) Control device opacity standard. Four commentators suggested that the proposed control device opacity standard either be revised from less than five percent opacity to less than ten percent opacity based on six-minute average values or that a separate opacity standard be established for visible emissions during the cleaning cycle of shaker-type fabric filter collectors. EPA's experience indicates that a time exemption to allow for puffing during the cleaning cycle of the fabric filter collector is not necessary. For this application, a well-designed and well-maintained fabric filter standard. On the basis of available data, a five percent opacity standard (based on six-minute average values) also is unnecessarily lenient.

The proposed opacity standard to ten percent (based on six-minute average values) was considered in light of recent changes to Method 9 of Appendix A to this part (29 FR 39872). The revisions to Method 9 require that compliance with opacity standards be determined by averaging sets of 24 consecutive observations taken at 15-second intervals (six-minute averages). All six-minute average values of the opacity data used as the basis for the proposed opacity standard are zero percent. EPA believes that the ten percent standard suggested by the commentators would allow much less effective operation and maintenance of the control device than is required by the concentration standard. On the basis of available data, a five percent opacity standard (based on six-minute average values) also is unnecessarily lenient.

The proposed opacity standard of zero percent was revised slightly upward to be consistent with previously established opacity standards which are less stringent than their associated concentration standards without being unduly lax. The promulgated opacity standard limits emissions from the control device to less than three percent opacity (based on averaging sets of 24 consecutive observations taken at 15-second intervals). Use of six-minute average values to determine compliance with applicable opacity standards makes opacity levels of any value possible, instead of the previous method's limitation of values at discrete intervals of five percent opacity.

(4) Standards on emissions from the shop. Twelve commentators questioned the value of the shop opacity standards, arguing that the proposed standards are unenforceable, too lenient, or too stringent.

Commentators arguing for less stringent or more stringent standards suggested various alternative opacity values for the charging or tapping period standards, different averaging periods, and a different limitation on emissions from the shop during the meltdown and refining period of the EAF operation. Because of these comments, the basis for these suggestions was delaminated, including a review of all available data, and follow-up contacts with commentators who had offered suggestions. The revision of the proposed standard was the suggested revisions were opinions only and were not based on actual data. The re-evaluation of the data bases of the proposed standards reaffirmed that the standards will be achievable by application of best control technology considering costs. Hence, EPA concluded that the standards are reasonable (neither too stringent nor too lenient) and that revision of these standards is not warranted in the absence of specific information indicating such a need.

Four commentators believed that the proposed standards were impractical to enforce for the following reasons:

1. Intermingling of emissions from emissions exiting from the shop opacity standards would make enforcement of the standards impossible.

2. The standards would require a continuous monitoring system to establish the baseline operating conditions. Continuous monitoring of the flow rate through each separately ducted control system is required for each electric arc furnaces subject to this regulation. Because of the high flow rates of the electric arc furnaces that use a direct shell evacuation system to collect the refining and meltdown period emissions, continuous flow rates and pressure data will provide a continuous record of the operation of the control systems. Facilities that use a building evacuation system for capture and control of emissions are not subject to the flow rate and pressure monitoring requirements if the building roof is never opened.

Four of the shop opacity standards promulgated herein are applicable only during demonstrations of compliance of the affected facility. At all other times the control device can be shut down for the duration of the evaluation. The monitoring of operations requirements will simplify enforcement of the regulation because neither the enforcing agency nor the owner or operator need show that any apparent violation was or was not due to operation of non-regulated sources.

The promulgated regulation's monitoring of operation requirements will add negligible additional costs to the total cost of complying with the promulgated standards of performance. Flow rate monitoring with a continuous flowrate monitoring device to meet the requirements of § 60.274(b) can be installed for $600-$4000 depending on the flow profile of the area being monitored and the complexity of the monitoring device. Devices that monitor
the pressure inside the free space of an electric arc furnace equipped with a direct shell evacuation system are installed by most owners or operators in order to obtain better control of the furnace operation. Consequently, for most owners or operators, the pressure monitoring requirements in this subpart are applicable to capture systems for ferroalloy production facilities regulation and the electric arc furnace regulation. The pressure monitoring requirements are to require effective capture and control of emissions from the source. The pressure monitoring requirements for capture of charging and tapping period emissions must be located at least 30 or 40 feet above the furnace to allow free movement of the crane which charges raw materials to the furnace. Fumes from charging, tapping, and other activities rise and accumulate in the upper areas of the building, thus obscuring visibility. Because visibility within the shop is critical, the performance of the emission collection system can only be evaluated at the point where emissions are discharged through a stack.

Rules and Regulations

FEDERAL REGISTER, VOL. 40, NO. 185—TUESDAY, SEPTEMBER 23, 1975

No.
nace operations do not require this large free space between the furnace and the collection device (hood). Visibly around the electric submerged arc furnace is good. Consequently, the performance of the collection device on a ferroalloy furnace may be evaluated at the collection area rather than at the point of discharge to the atmosphere.

Effective date. In accordance with section 111 of the Act, these regulations prescribing standards of performance for electric arc furnaces in the steel industry are effective on September 23, 1975, and apply to electric arc furnaces and their associated dust-handling equipment, the construction or modification of which was commenced after October 31, 1974.

Dated: September 15, 1975.
JOHN QUARLES,
Acting Administrator.

Part 60 of Chapter I, Title 40 of the Code of Federal Regulations is amended as follows:

1. The table of sections is amended by adding subpart AA as follows:

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.270 Applicability and designation of affected facility.

The provisions of this subpart are applicable to the following affected facilities in steel plants: electric arc furnaces and dust-handling equipment.

§ 60.271 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in subpart A of this part.

(a) "Electric arc furnace" (EAF) means any furnace that produces molten steel from electrically heated charge materials with electric arcs from carbon electrodes. Furnaces from which the molten steel is cast into the shape of finished products, such as in a foundry, are not affected facilities included within the scope of this definition. Furnaces which, as the primary source of iron, continuously feed prereduced ore pellets are not affected facilities within the scope of this definition.

(b) "Dust-handling equipment" means any equipment used to handle particulate matter collected by the control device and located at or near the control device for an EAF subject to this subpart.

(c) "Control device" means the air pollution control equipment used to remove particulate matter generated by an EAF(g) from the effluent gas stream.

Subpart AA— Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.272 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere any gaseous emissions containing over three percent opacity.

(b) Except as provided under paragraph (d) of this section, the owner or operator subject to the provisions of this subpart shall install, calibrate, and maintain a monitoring device that continuously records the volumetric flow rate through each separately ducted hood.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.273 Emission monitoring.

(a) A continuous monitoring system for the measurement of the opacity of emissions discharged to the atmosphere from the control device(s) shall be installed, calibrated, maintained, and operated by the owner or operator subject to the provisions of this subpart.

(b) For purposes under § 60.7(c), periods of excess emissions that shall be reported are defined as all six-minute periods during which the average opacity is three percent or greater.

§ 60.274 Monitoring of operations.

(a) The owner or operator subject to the provisions of this subpart shall maintain records daily of the following information:

(1) Time and duration of each charge;
(2) Time and duration of each tap;
(3) All flow rate data obtained under paragraph (b) of this section, or equivalent obtained under paragraph (d) of this section;

(b) Except as provided under paragraph (d) of this section, the owner or operator subject to the provisions of this subpart shall install, calibrate, and maintain a monitoring device that continuously records the volumetric flow rate through each separately ducted hood.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.275 Test methods and procedures.

For the purpose of reports under § 60.7(c), periods of excess emissions that shall be reported are defined as all six-minute periods during which the average opacity is three percent or greater.

§ 60.276 Applicability of other requirements.

(a) Except as provided under paragraph (d) of this section, the owner or operator subject to the provisions of this subpart shall install, calibrate, and maintain a monitoring device that continuously records the volumetric flow rate through each separately ducted hood.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.277 Additional requirements.

(a) Periodic inspections.

(b) Reporting.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.278 Other standards.

(a) Other air pollution control equipment used to reduce emissions of sulfur dioxide and particulate matter.

(b) Other requirements.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.279 Compliance schedule.

(a) Compliance dates.

(b) Exception.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.280 Definitions.

(a) As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in subpart A of this part.

(b) "Emission" means the act of causing emissions to be discharged to the atmosphere.

(c) "Monitoring and control" means all equipment, processes, and related equipment necessary to effectively reduce or control emissions to the atmosphere from a facility.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.281 Reporting.

(a) Every owner or operator subject to the provisions of this subpart shall report in writing to the Administrator the information required by § 60.273.

(b) The operator shall maintain records of the emissions for which reports are required to be filed.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.282 Records.

(a) All records required under this section shall be kept for a period of not less than three years.

(b) Within 30 days after receipt of a written request, the owner or operator subject to the provisions of this subpart shall furnish to the Administrator the records referred to in paragraph (a) of this section.

(c) The owner or operator subject to the provisions of this subpart shall keep the records referred to in paragraph (a) of this section available for inspection and copying by the Administrator or any duly authorized representative at all reasonable hours.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.283 Certification.

(a) Certification.

(b) Inspection.

(c) Authority.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.284 Compliance.

(a) Effective date.

(b) Construction.

(c) Maintenance.

(d) Effective date.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.285 Enforcement.

(a) General.

(b) Additional responsibilities.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.286 Public notice.

(a) Publication in the Federal Register.

(b) Notice to the public.

(c) Other notices.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.287 Permits.

(a) General.

(b) Compliance.

(c) Enforcement.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.288 Records and reporting.

(a) Records.

(b) Reporting.

(c) Cessation of operations.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.289 Other provisions.

(a) Applicability.

(b) Effective date.

(c) Annual report.

(d) Precedence.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.290 Revocation.

(a) General.

(b) Grounds.

Subpart AA—Standards of Performance for Steel Plants: Electric Arc Furnaces

§ 60.291 Amendments.

(a) General.

(b) Effective date.

(c) Amendment of part 60, subpart A.
metric flow rates through each separately ducted hood shall be determined during all periods in which the hood is operated for the purpose of capturing emissions from the EAF using the monitoring device under paragraph (b) of this section. The owner or operator may petition the Administrator for reestablishment of these flow rates whenever the owner or operator can demonstrate to the Administrator's satisfaction that the EAF operating conditions upon which the flow rates were previously established are no longer applicable. The flow rates determined during the most recent demonstration of compliance shall be maintained (or may be exceeded) at the appropriate level for each applicable period. Operation at lower flow rates may be considered by the Administrator to be unacceptable operation and maintenance of the affected facility.

(d) The owner or operator may petition the Administrator to approve any alternative method that will provide a continuous record of operation of each emission capture system.

(e) Where emissions during any phase of the heat time are controlled by use of a direct shell evacuation system, the owner or operator shall install, calibrate, and maintain a monitoring device that continuously records the pressure in the free space inside the EAF. The pressure shall be recorded as 15-minute integrated averages. The monitoring device may be installed in any appropriate location in the EAF such that reproducible results will be obtained. The pressure monitoring device shall have an accuracy of ±5 mm of water gauge over its normal operating range and shall be calibrated according to the manufacturer's instructions.

(f) When the owner or operator of an EAF is required to demonstrate compliance with the standard under § 60.272 (a) (3) and at any other time the Administrator may require (under section 114 of the Act, as amended), the pressure in the free space inside the furnace shall be determined during the meltdown and refining period(s) using the monitoring device under paragraph (e) of this section. The owner or operator may petition the Administrator for reestablishment of the 15-minute integrated average pressure whenever the owner or operator can demonstrate to the Administrator's satisfaction that the EAF operating conditions upon which the pressures were previously established are no longer applicable. The pressure determined during the most recent demonstration of compliance shall be maintained at all times the EAF is operating in a meltdown and refining period. Operation at higher pressures may be considered by the Administrator to be unacceptable operation and maintenance of the affected facility.

(g) Where the capture system is designed and operated such that all emissions are captured and ducted to a control device, the owner or operator shall not be subject to the requirements of this section.

§ 60.275 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided under § 60.8(b), shall be used to determine compliance with the standards prescribed under § 60.272 as follows:

(1) Method 5 for concentration of particulate matter and associated moisture content;

(2) Method 1 for sample and velocity traverses;

(3) Method 2 for velocity and volumetric flow rate; and

(4) Method 3 for gas analysis.

(b) For Method 5, the sampling time for each run shall be at least four hours. When a single EAF is sampled, the sampling time for each run shall also include an integral number of heats. Shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator. The minimum sample volume shall be 4.5 decimeters (160 deciliters).

(c) For the purpose of this subpart, the owner or operator shall conduct the demonstration of compliance with § 60.272(a) (3) and furnish the Administrator a written report of the results of the test.

(d) During any performance test required under § 60.8 of this part, no gaseous diluents may be added to the effluent gas stream after the fabric in any pressurized fabric filter collector, unless the amount of dilution is separately determined and considered in the determination of emissions.

(e) When more than one control device serves the EAF(s) being tested, the concentration of particulate matter shall be determined using the following equation:

\[ N \sum_{n=1}^{N} (C_n Q_n) \]

\[ C_{eq} = \frac{N \sum_{n=1}^{N} (C_n Q_n)}{\sum_{n=1}^{N} (Q_n)} \]

where:

\[ C_{eq} = \text{concentration of particulate matter in mg/dm}^3 \text{ or} \text{gr/dscf} \text{ as determined by method 2} \]

\[ N = \text{total number of control devices tested} \]

\[ Q_n = \text{volumetric flow rate of the effluent gas stream in decimeters (dm) or} \text{deciliters (dl) as determined by method 2} \]

\[ (C_n Q_n) \text{ or } (Q_n) = \text{value of the applicable parameter for each control device tested} \]

(f) Any control device subject to the provisions of this subpart shall be designed and constructed to allow measurement of emissions using applicable test methods and procedures.

(g) Where emissions from any EAF(a) are combined with emissions from facilities not subject to the provisions of this subpart but controlled by a common capture system and control device, the owner or operator may use any of the following procedures during a performance test:

(1) Base compliance on control of the combined emissions.

(2) Utilize a method acceptable to the Administrator which compensates for the emissions from the facilities not subject to the provisions of this subpart.

(3) Any combination of the criteria of paragraphs (g) (1) and (g) (2) of this section.

(h) Where emissions from any EAF(a) are combined with emissions from facilities not subject to the provisions of this subpart, the owner or operator may use any of the following procedures for demonstrating compliance with § 60.272 (a) (3):

(1) Base compliance on control of the combined emissions.

(2) Shut down operation of facilities not subject to the provisions of this subpart.

(3) Any combination of the criteria of paragraphs (h) (1) and (h) (2) of this section.

(Secs. 111 and 114 of the Clean Air Act, as amended by sec. 4(a) of Pub. L. 91–604, 84 Stat. 1618 (42 U.S.C. 1867c–6, 1867o–9))