United States
Environmental Protection
Agency

Office of Water and
Waste Management
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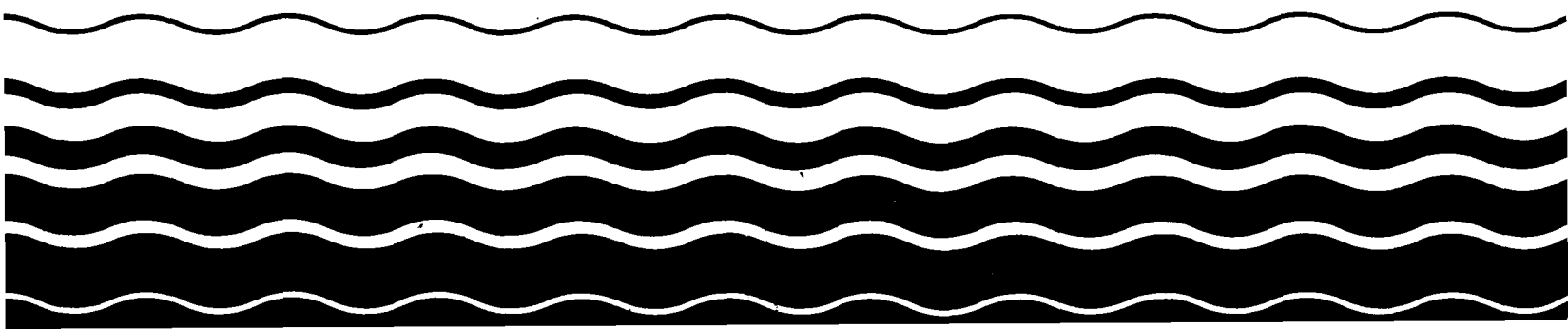
EPA

Proposed Effluent Guidelines

Rulemaking for the Iron and Steel Manufacturing Point Source Category



Background

The Clean Water Act

Under the Clean Water Act (the Federal Water Pollution Control Act Amendments of 1972, as amended by the Clean Water Act of 1977), the Environmental Protection Agency (EPA) is charged with the responsibility to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.

Direct Dischargers

The act requires that all industries discharging wastes into navigable waters achieve by July 1, 1977, the "best practicable control technology currently available" (BPT). This control technology represents the average of the best existing waste treatment performance within each industry category or subcategory.

By July 1, 1984, the Act requires the achievement of effluent limitations based on the very best control and treatment measures that have been developed or that are capable of being developed within the industry category or subcategory. These effluent limitations require the following controls:

- *Toxic and Nonconventional Pollutants*—Application of the "best available technology economically achievable" (BAT)
- *Conventional Pollutants*—Application of the "best conventional pollutant control technology" (BCT)

New source performance standards (NSPS) are also established for new industrial direct dischargers. NSPS, which goes into effect at the commencement of operation, is described as the "best available demonstrated control technology, processes, operating methods, or other alternatives including, where practicable, a standard permitting no discharge of pollutants."

Indirect Dischargers

Indirect dischargers are industrial facilities that discharge pollutants to publicly owned treatment works (POTW). The Clean Water Act directs EPA to establish national pretreatment standards for pollutants that are incompatible with or pass through municipal treatment plants. The Act requires:

- Achievement, within 3 years of promulgation, of pretreatment standards for existing sources (PSES)
- Achievement, upon commencement of operation, of pretreatment standards for new sources (PSNS)

Purpose of Proposed Regulation

The primary purpose of this proposed regulation is to provide effluent limitations guidelines for BPT, BAT, and BCT and to establish NSPS, PSES, and PSNS under Sections 301, 304, 306, 307, and 501 of the Clean Water Act.

While the requirements for direct dischargers are to be incorporated into National Pollutant Discharge Elimination System (NPDES) permits issued under Section 402 of the Act by EPA and participating States, pretreatment standards are enforceable directly by the Agency against indirect dischargers.

The proposed regulation does not require the installation of any particular treatment technology. Rather, it requires the achievement of effluent limitations representative of the proper operation of treatment model technologies or equivalent tecnologies.

Industry

Coverage

The Iron and Steel Manufacturing Industry is included within the U.S. Department of Commerce, Bureau of the Census Standard Industrial Classification (SIC) 3300. This proposed regulation applies to subgroups SIC 3312 (except forgings and cold coatings), 3315, 3316, and 3317, which include all processes, subprocesses, and alternative processes involved in manufacturing intermediate or finished products.

The Iron and Steel Manufacturing Industry uses a variety of processes that require large quantities of raw materials. The industry can be divided into raw steelmaking and forming and finishing. Steel facilities range from plants using few processes to extremely large industrial complexes that may use all production processes.

- In 1978, revenues of the U.S. Steel industry were $46 billion; it ranks third in the Nation in value of total shipments and accounts for about 15 percent of world production
- In 1978, approximately 87 percent of the total U.S. steel ingot output was produced by 15 corporations
- This industry is one of the highest water users of all manufacturing industries—water is essential in almost all process operations, with an average 40,000 gallons required to produce 1 ton of finished steel

Pollutants

Pollutants discharged by the industry include:

- *Toxic Pollutants*—Total and hexavalent chromium, cyanide, phenols, copper, lead, tin, nickel, zinc, cadmium, and approximately 40 toxic organics

- *Conventional Pollutants*—TSS, pH, and oil and grease
- *Nonconventional Pollutants*—Fluoride, ammonia-N, and iron

EPA's Development Program

To implement the Clean Water Act, EPA conducted a complex development program. This program included:

- Development of analytical methods for detecting and measuring toxic pollutants
- Sampling of intake water and raw and treated wastewater at a representative number of plants
- Use of the best state-of-the-art methods for detection of toxics, i.e., atomic adsorption spectrometry (AAS), inductively coupled argon plasma (ICAP) spectrometry, and gas chromatography/mass spectrometry (GC/MS)

Technical Data Gathering

The technical analysis was based on:

- Data Collection Portfolios (DCPs) requesting information on processes and production as they relate to water usage and wastewater generation. DCPs were sent to all U.S. steelmaking and 85 percent of U.S. steel forming and finishing operations, of which 393 steelmaking and 1,631 steel forming and finishing operations responded
- Detailed DCPs (D-DCPs) requesting detailed cost information and long-term test data results were sent to 50 steelmaking and 128 forming and finishing facilities
- A two-part sampling and analysis program involving 31 steelmaking and 83 forming and finishing facilities
- Data from previous studies, NPDES permit files, Discharge Monitoring Reports, contacts with suppliers of pollutant control equipment, treatability studies, and literature searches

Methodology

After developing analytical methods for detecting and measuring toxic pollutants, EPA studied the Iron and Steel Manufacturing Industry to determine whether separate standards were needed for different segments of the industry.

Next, EPA identified the wastewater constituents to be considered for effluent limitations guidelines and standards of performance and identified in-plant and end-of-process treatment technologies that were being used, or that could be used, by the industry. EPA analyzed data on the performance of each technology and its associated non-water-quality environmental impacts.

The cost of each control and treatment technology was estimated for model facilities for each subcategory or subdivision. Baseline projections of costs were computed for up to five alternative treatment models in each subcategory or subdivision. Costs were also calculated for the steel industry as a whole for installing technologies capable of achieving various levels of regulation. The economic impacts of these costs were then evaluated.

EPA then identified the various treatment technology options for BPT, BCT, BAT, NSPS, PSES, and PSNS. Finally, EPA selected the preferred option by industry subcategory or subdivision for each set of standards.

Subcategories

EPA found that the manufacturing processes of the Iron and Steel Manufacturing Industry provide the most significant basis for determining subcategories. Consequently, EPA has divided the industry into the following 12 main process subcategories:

- Cokemaking
- Sintering
- Ironmaking
- Steelmaking
- Vacuum Degassing
- Continuous Casting
- Hot Forming
- Scale Removal
- Acid Pickling
- Cold Forming
- Alkaline Cleaning
- Hot Coating

The Agency further segmented the subcategories into 50 subdivisions based on product type, composition, shape, water use rates, control technologies, and process variations.

Summary of Control Technologies Considered

The following pollution control techniques and technologies were considered by EPA in developing standards for the Iron and Steel Manufacturing Industry:

- In-plant control
  - —Cascade rinse systems in pickling and hot coating operations to reduce rinse flow discharges by up to 95 percent
  - —Process modifications and reduction of wastewater generation by recycle and reuse
- End-of-pipe treatment
- Add-on technology to BPT for BAT, BCT, NSPS, PSES, and PSNS treatment levels
  - —Extended biological treatment (cokemaking)
  - —Granular activated carbon
  - —Powdered carbon addition
  - —Pressure filtration with and without sulfide addition
  - —Multistage evaporation/condensation systems

The Proposed Regulation

The regulation for BPT, BAT, BCT, NSPS, PSES, and PSNS was developed for specific subcategories. Detailed discussions of the regulation, technologies, and rationales are contained in sections of each of 12 subcategory reports in the *Development Document for Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category* (EPA 440/1-80/024b, December 1980). The pertinent sections are as follows:

- BPT—Section IX
- BAT—Section X
- BCT—Section XI
- NSPS—Section XII
- PSES, PSNS—Section XIII

Regulated Pollutants

Proposed BPT

- Same as those for prior BPT with some deletions in various subcategories

Proposed BCT

- TSS, pH, and oil and grease

Proposed BAT, NSPS, PSES, and PSNS

- Phenols (4AAP), cyanide, cadmium, chromium, copper, lead, nickel, zinc, ammonia-N, fluoride, benzene, naphthalene, benzo(a)pyrene, 1, 1, 1-trichloroethane, 2-nitrophenol, anthracene, and tetrachloroethylene

Effluent Reduction Benefits

- Proposed BAT and BCT limitations will result in removal per year (from BPT effluents) of:
  - —1,900 tons of toxic organic pollutants
  - —2,500 tons of toxic metals
  - —130,000 tons of other pollutants

Non-Water-Quality Aspects of Pollution Control

Air Pollution

- Aeration of cokemaking wastewaters may release minimal amounts of volatile organic compounds
- Small emissions may result as ironmaking wastewaters quench hot slag
- Water vapor having some particulates will be released from cooling tower systems

Solid Waste

- No significant change in solid waste generation is anticipated

Consumptive Water Loss

- None of the requirements will cause significant evaporative water loss

Energy Requirements

- A net increase of 2.07 billion kilowatt hours will be incurred at the BPT, BAT, and BCT levels of treatment, 3.6 percent of the electrical (0.6 percent of the total) energy consumed by the industry in 1978

Best Management Practices

Although EPA is not proposing them at this time, the Agency is considering development of BMP specific to the Iron and Steel Manufacturing Industry. These will be applicable to all industrial sites and will offer guidance to permit authorities in establishing the BMP required by unique circumstances at a given plant.

Economic Impact Analysis

The economic analysis was based on:

- A policy-testing model that combined a methodology for calculating economic effects with the cost-impact methodology used by the American Iron and Steel Institute (AISI)
- An assessment of the economic impact of the proposed regulation under three scenarios

The impacts of the three scenarios are summarized in Tables 1 and 2.

—Scenario 1:

A continuation, from 1981 to 1990, of the economic environment and governmental policy faced over the last 10 years with two subscenarios: zero passthrough of annual costs and full passthrough of annual costs

—Scenario 2:

A 3-percent growth in steel shipments; higher profitability; and policy changes, including quicker recovery of capital investments, return to "fair value" import prices, and latitude to increase prices

—Scenario 3:

Changed economic environment as a result of governmental policies, such as increased real economic growth, reinstatement of trigger prices, and a 40-percent increase in depreciation cash flows

TABLE 1
SHORT-RUN ECONOMIC IMPACT OF PROPOSED WATER POLLUTION CONTROL REGULATION—1984

	Domestic Shipments (millions of net tons)	Number of Employees (thousands)	Market Share (percent)
Industry Status in 1979	100.3	342.0	84.8
Scenario 1: Baseline	101.3	334.5	82.0
Additional Water Pollution Control Costs			
Zero Passthrough	101.3	335.8	82.0
Full Passthrough	101.3	335.8	82.0
Scenario 2: Baseline	106.7	356.0	82.0
Additional Water Pollution Control Costs	106.7	357.3	82.0
Scenario 3: Baseline	106.6	354.8	85.0*
Additional Water Pollution Control Costs	106.6	356.1	85.0

*Reflects new surge provisions of recently reinstituted Trigger Price Mechanism.

TABLE 2
LONG-RUN ECONOMIC IMPACT OF PROPOSED WATER POLLUTION CONTROL REGULATION—1990

	Domestic Shipments (millions of net tons)	Number of Employees (thousands)	Market Share (percent)
Industry Status in 1979	100.3	342.0	84.8
Scenario 1: Baseline	92.4	271.1	71.5
Additional Water Pollution Control Costs			
Zero Passthrough	86.1	254.6	66.6
Full Passthrough	89.1	262.9	68.9
Scenario 2: Baseline	126.0	366.4	82.0
Additional Water Pollution Control Costs	126.0	368.3	82.0
Scenario 3: Baseline	117.8	341.5	85.0*
Additional Water Pollution Control Costs	115.3	336.0	83.2*

*Represents recovery from baseline market share of 77.8 percent in 1988 and from market share after additional water pollution control costs of 73.4 percent, also in 1988.

- Total additional investment costs are estimated at $1.02 billion

  —BPT: $418 million

  —BAT: $444 million

  —NSPS: $159 million

- Incremental annual costs are estimated at $264 million in 1984, decreasing to $226 million in 1990

  —BPT: $97 million decreasing to $93 million

  —BAT: $150 million decreasing to $93 million

  —NSPS: $17 million increasing to $40 million

- Industry's ability both to finance baseline production and to satisfy capital requirements for water pollution control from 1981 to 1990 depends heavily on governmental policy changes

- EPA believes that Scenario 3 represents the operating environment the Iron and Steel Manufacturing Industry probably will face in the 1980's. In this event, these regulations will have the following impact:

  —Temporary job loss of 14,540 below projected baseline for late 1980's, but rising to only 5,500 below baseline in 1990

  —Decreased market share of 4.4 percentage points below baseline for late 1980's, but rising to only 1.8 percent below baseline in 1990

Glossary

AAS	Atomic adsorption spectrophotometry
AISI	American Iron and Steel Institute
BAT	"Best available technology economically achievable," to be achieved by July 1, 1984
BCT	"Best conventional pollutant control technology," to be achieved by July 1, 1984
BMP	Best management practices
BPT	"Best practicable control technology currently available," to be achieved by July 1, 1977
DCP	Data Collection Portfolio
D-DCP	Detailed Data Collection Portfolio
EPA	U.S. Environmental Protection Agency
GC/MS	Gas chromatography/mass spectrometry
ICAP	Inductively coupled argon plasma
NPDES	National Pollutant Discharge Elimination System
NSPS	New source performance standards, to be achieved upon commencement of operation of a new plant
POTW	Publicly owned treatment works
PSES	Pretreatment standards for existing sources, to be achieved within 3 years of promulgation of a regulation
PSNS	Pretreatment standards for new sources, to be achieved upon commencement of operation of a new plant
SIC	Standard Industrial Classification (*Department of Commerce*, Bureau of the Census)
TSS	Total suspended solids

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