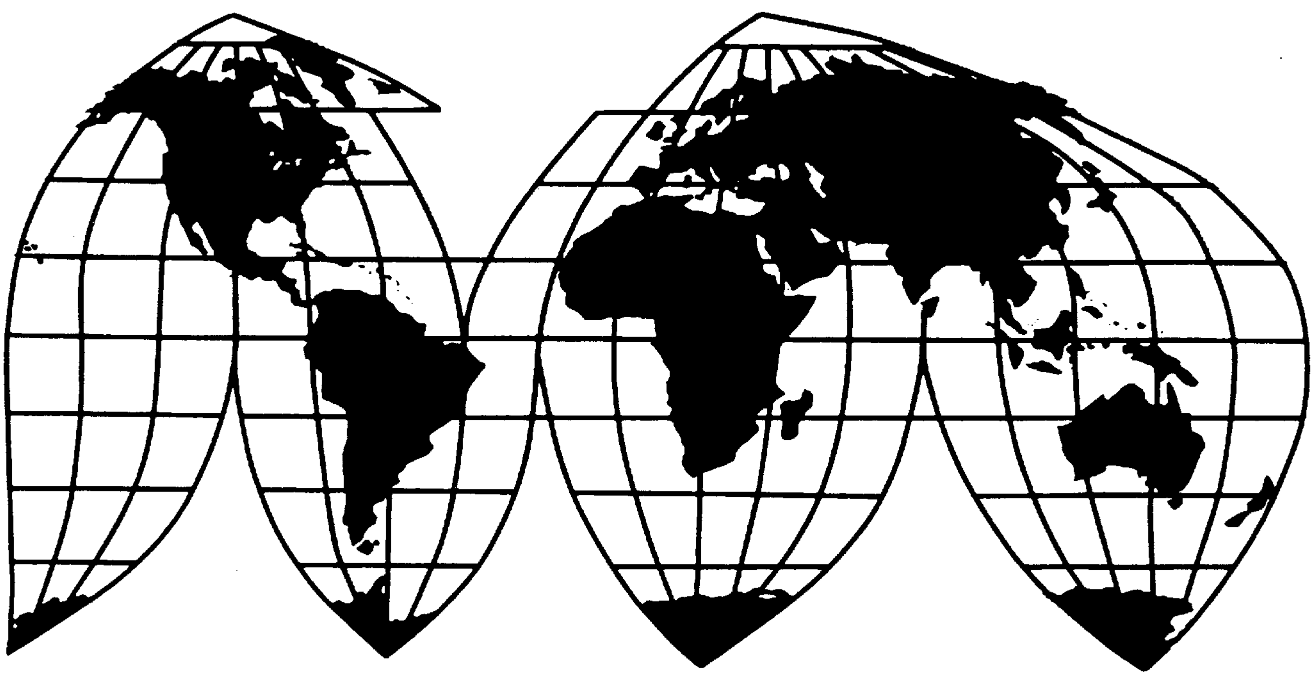
Foundry Coke: A Review of the Industries in the United States and China

Investigation No. 332-407

Publication 3323 **July 2000**

U.S. International Trade Commission



Washington, DC 20436

U.S. International Trade Commission

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ABSTRACT

On August 25, 1999, at the request of the House Committee on Ways and Means (the Committee),[1] the U.S. International Trade Commission (the Commission) instituted investigation No. 332-407, Foundry Coke: A Review of the Industries in the United States and China, under section 332(g) of the Tariff Act of 1930, 19 U.S.C. §1332(g), to review the foundry coke industries in the United States and the People's Republic of China (China) and provide various market information for 1995-99. The Commission was requested to submit the final report to the Committee within 1 year of receipt of the letter, or by August 25, 2000.[2]

Foundry coke, a subgroup of metallurgical coke,[3] is the carbonized product remaining after the destructive distillation of certain types of coals. Foundry coke, which accounts for 5 to 7 percent of annual U.S. metallurgical coke production, is used primarily in the production of cast iron in cupola furnaces, both as a fuel and as a source of carbon for the melted product.

The U.S. foundry coke industry comprises six producers (one additional firm produced only in 1999) with a total 1999 capacity to produce about 1.6 million metric tons of foundry coke annually. In 1999, the U.S. foundry coke producers operated a total of 14 batteries with a combined total of 605 ovens producing 1.25 million metric tons of foundry coke, about 76 percent of capacity. U.S. imports of foundry coke in 1999 amounted to 133,000 metric tons with an average unit value of $113 per metric ton, c.i.f., and were nearly all from China. Domestic contract prices for foundry coke averaged $176 per metric ton, f.o.b., in 1999. The U.S. industry is currently concerned with a number of issues that could affect its competitiveness in domestic markets, such as aging coke ovens, more stringent environmental regulations to be met in the next few years, and rising levels of imports from China.

The Chinese foundry coke industry, with an estimated capacity of 2.9 million metric tons in 1997, is the world's largest exporter of foundry coke. In 1997, Chinese foundry coke production was estimated at 2.6 to 2.7 million metric tons,[4] with about half of production exported. Chinese industry production costs from a representative producer ranged from $36 to $55 per metric ton, f.o.b. plant. When internal Chinese transportation and handling costs ranging from $25 to $37 per metric ton are added, the total cost increases to as much as $92 per metric ton at the Chinese port. Chinese foundry coke production is located in Shanxi Province in central China. In compliance with new environmental regulations issued at both the national and provincial levels, many of the older technology ovens have been closed, resulting in a decline in the production of all types of coke in 1999. The final number of oven closures has not yet been determined, and will depend, to a great extent, on the compliance of the foundry coke producers and enforcement by the Chinese Government.

Public notice of this investigation was posted in the Office of the Secretary, U.S. International Trade Commission, Washington, DC 20436, and published in the *Federal Register* (64 FR 51556) of September 23, 1999.[5] A public hearing was held on February 29, 2000, in Washington, DC.[6] Nothing in this report should be construed as indicating how the Commission would find in an investigation conducted under other statutory authority covering the same or similar subject matter.

[1] The request from the Committee is reproduced in full in appendix A.
[2] On May 25, 2000, the Commission received a letter from the Ways and Means Committee requesting a change in the submission date of the final report to July 7, 2000. A copy of the letter may be found in appendix B.
[3] The subgroups of metallurgical coke are blast furnace coke, foundry coke, and other industrial coke.
[4] Chinese production is based on the production capacity in 1997 and overall coke capacity utilization rate.
[5] A copy of this notice is reproduced in appendix C.
[6] A list of witnesses who testified at the hearing is included in appendix D.

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Executive Summary

On August 25, 1999, the U.S. International Trade Commission (Commission) received a letter from the House Committee on Ways and Means (the Committee) requesting the institution of a fact-finding investigation under section 332(g) of the Tariff Act of 1930, 19 U.S.C. §1332(g), to review the foundry coke industries in the United States and the People's Republic of China (China) and provide various market information for 1995-99.[1] The Commission was requested to submit its final report to the Committee within 1 year of receipt of the letter, or by August 25, 2000.[2] During the course of its investigation, the Commission conducted extensive fieldwork in both the United States and China, held a public hearing in Washington, D.C., and completed a questionnaire survey of U.S. producers, U.S. purchasers, U.S. importers, and Chinese producers. The highlights of this fact-finding investigation are presented below and in table ES-1 found at the end of this Executive Summary.

Industry Profiles

The U.S. and Chinese foundry coke industries, two of the largest such industries in the world, produced 1.25 million metric tons (1999) and an estimated 2.6 to 2.7 million metric tons (1997),[3] respectively. The U.S. foundry coke industry is by far the older of the two industries, with roots dating back to the early 1900s; the Chinese industry did not achieve significant production levels until the 1980s. Competition between the United States and China in the U.S. foundry coke market has an even shorter history, dating back to 1997, the first year in which the United States imported foundry coke from China. Although more than half of current Chinese foundry coke production capacity was built after 1990, China is now the world's largest exporter of foundry coke and the largest U.S. import supplier.

Despite producing similar products, the two industries have significant differences. The U.S. industry uses slot ovens, about 605 in number, that allow for the recovery of all volatile materials generated. In the course of maintaining the ovens, many of which were built in the 1940s and 1950s, the U.S. industry has developed several useful technologies, including brick replacement technology for oven walls, reliable sealing techniques, and efficient coal-mixing techniques. In addition to focusing on expenditures intended to maintain existing ovens and lengthen their lifespan, U.S. firms have spent substantial capital on coal-blending facilities, screening facilities, and other technologies specific to the production and handling of foundry coke.

The Chinese foundry coke industry depends heavily on nonrecovery beehive ovens and modified versions of beehive ovens, a technology no longer used in the United States due, in part, to environmental concerns . About 1,460 such ovens were operational in 1997 in Shanxi Province, which accounts for virtually all the foundry coke production in China. Slot ovens are also currently used in China, but are restricted to the production of coke other than foundry coke. Capital and operating costs reported for the Chinese industry are significantly lower compared with the U.S. industry. However, the Chinese industry may have to make significant expenditures

[1] A copy of the letter may be found in appendix A. Foundry coke, a subgroup of metallurgical coke, is primarily used in the production of cast iron in cupola furnaces, both as a fuel and as a source of carbon for the melted product. The two other subgroups of metallurgical coke are blast furnace coke and other industrial coke.

[2] On May 25, 2000, the Commission received a letter from the Ways and Means Committee requesting a change in the submission date of the final report to July 7, 2000. A copy of the letter may be found in appendix B.

[3] This estimated figure is derived from the 1997 production capacity of 2.89 million metric tons multiplied by the capacity utilization rate of 92.1 percent for all coke production. Since the capacity utilization rate for foundry coke is believed to be lower than blast furnace coke, the estimate may be overstated.

in the future to replace beehive ovens with slot ovens because of increased enforcement of existing and new Chinese regulations.

Production Costs

Production costs in the two countries vary, ranging from about $36 to $55 per metric ton in China for foundry coke to about $138 per metric ton in the United States in 1999. Internal Chinese transportation and handling costs ranging from $25 to $37 per metric ton for product intended for export could raise the cost to as much as $92 per metric ton at the Chinese port. China has a significant per ton cost advantage in each of the major components of production (i.e., coal and labor). Coal costs in China ranged from $12 to $18 per metric ton of coal, while in the United States the cost was about $58 to $65 per metric ton delivered. Labor costs associated with the production of foundry coke in China are also lower than those in the United States, ranging from $2.65-$10.65 per metric ton of coke produced in China to about $25.58 per metric ton in the United States.

Environmental Costs

While there are some similarities between the respective national environmental standards and guidelines that apply to the foundry coke industries in China and the United States, the United States has more comprehensive environmental regulations (which appear to be getting stricter as new emissions standards are promulgated), more rigorous enforcement (daily inspections for air pollution and more frequent sampling and testing of wastewater), more sophisticated environmental protection technology and equipment in place, and more stringent operating practices. These differences result in significantly higher levels of current capital and operating costs for environmental protection in the United States. However, China reportedly is redrafting some of its environmental laws, regulations, and institutions and developing new laws and policies designed to improve the environmental performance of its industries. Significant numbers of beehive ovens have been shut down because of more stringent environmental enforcement, and other ovens are subject to closure in the near future.

Transportation Costs

Although a significant proportion of U.S.-produced coke is still consumed at foundries a short distance from the source of supply, some domestic foundries are increasingly making purchases from distant Chinese suppliers. Despite the difference in distance traveled by imports and domestic shipments, the cost effectiveness of ocean freight mitigates the disadvantage of long shipping distances from China to certain domestic consumers. In certain transactions, firms purchasing domestic coke face higher transportation costs than if they purchase the imported product.

U.S. and Chinese Markets

U.S. foundries traditionally have consumed domestic foundry coke. In recent years, U.S. demand has increased in line with increased demand for iron castings used in trucks and sport utility vehicles. U.S. foundry coke consumption levels averaged 1.1 million metric tons during 1995-98. In 1999, however, consumption rose slightly to 1.2 million metric tons. U.S. exports of foundry coke fluctuated slightly during 1995-99 ranging from a low of 94,000 metric tons in 1996 to a high of 107,000 metric tons in 1999. The major markets for U.S. foundry coke exports during this period were Canada and Mexico, with some minor shipments to Central America.

The U.S. coke industry generally produces a high quality coke to meet customer demand. The U.S. industry does not produce the lower quality foundry coke that is imported from China. Although all consumers can use the high quality product for all applications, some consumers can use a lower quality coke in certain applications, such as pipe manufacture. Some of the cost savings incurred by use of imported product, however, may be offset by the need to use higher quantities of the imported coke.

In comparison, China is the sole supplier of its foundry coke needs; there is no evidence that China imports any foundry coke. Chinese consumption of foundry coke in 1997 was estimated to amount to no more than 1.3 to 1.4 million metric tons.

Exports of Chinese foundry coke are substantial and amounted to at least 1.2 million metric tons in 1997 with Japan, the EU, and the United States as China's largest export markets. The recent Asian economic crisis caused a downturn in construction and manufacturing in the region during 1998-99, resulting in decreased demand for iron and steel and, in turn, for foundry coke. Some representatives of the Chinese industry have stated that the increased exports of foundry coke to the United States during those years were temporary, diverted from their intended Asian markets.

Prices

About 85 percent of U.S.-produced foundry coke sold in the United States is on the basis of long-term contracts, with prices negotiated each year; about 50-55 percent of U.S. imports of Chinese foundry coke during 1999 were sold on a contract basis. The weighted average contract unit values (f.o.b.) for domestic foundry coke increased steadily from $175.81 per metric ton in 1995 to $185.74 per metric ton in 1998, before declining to $176.12 per metric ton in 1999. In comparison, weighted average unit values for U.S. imports of foundry coke from China decreased from $123.48 per metric ton in 1997 to $108.26 per metric ton in 1999.

Product Quality

Generally, U.S. producers reported that imported Chinese foundry coke can be technically used for the same applications as U.S.-produced foundry coke. However, U.S. purchasers indicated that Chinese coke is not substitutable for U.S.-produced coke in all applications. Approximately 75 percent of the importers, brokers, and purchasers who responded to the Commission's questionnaire stated the U.S. product is considered to be superior in terms of quality. Responding parties also suggested that Chinese and U.S. foundry cokes are generally "comparable" in terms of availability, delivery terms, delivery times, discounts offered, packaging, product consistency, and reliability of supply. U.S. purchasers of Chinese foundry coke stated that quality (chemical composition and consistency) and price are considered to be the most important factors affecting purchasing decisions.

Table ES-1
U.S. and Chinese foundry coke industries and markets

Item	United States	China
Firm	6 firms, located in AL, IN, NY, and PA (one additional firm produced only in 1999)	25 known firms in Shanxi Province
Production capacity	605 slot ovens (14 batteries) 1999 total capacity: 1.6 million metric tons (mt)	1,460 non-recovery beehive ovens 1997 total capacity: 2.9 million mt
Production	1.25 million mt in 1999	2.6 to 2.7 million mt in 1997
Technology	Foundry coke produced in mechanical, slot ovens.	Foundry coke produced in non-recovery beehive ovens.
Capital costs	A large share of the capital expended during 1995-99 was spent on maintaining existing facilities and lengthening lifespan of existing ovens, and ranged from $12-$20 million per year during period.	Chinese beehive ovens are simple brick structures and, in comparison to mechanized slot ovens, require little or no expenditures on maintenance.
Production costs	Rose from approximately $129 per mt in 1995 to $138 per mt in 1999.	$36 to $55 per metric ton, but may be as high as $92 per metric ton at the port when internal transportation/handling costs are added.
Environmental policies/costs	The U.S. industry is subject to significant environmental regulations on coke oven emission and is now approaching a second phase of added regulations. Producers report that operating costs for pollution abatement during 1995-99 ranged from $13.49 to $17.35 per mt.	The Chinese national government and provincial governments have announced a growing campaign for environmental protection. A succession of announcements have been directly aimed at the closure of all older models, higher polluting beehive ovens.
Transportation costs	In 1999, the average price to deliver a metric ton of output to the domestic purchaser regardless of distance was $24.81.	Estimated ocean freight costs for Chinese foundry coke are as follows: U.S. east coast, $26-$33; U.S. west coast, $13-$28; U.S. gulf coast, $10-$19. The weighted average cost in 1999 of shipping U.S. imports inland from the port to the plant was about $20.
Consumption	Generally flat during 1995-99, ending the period at 1.18 million mt in 1999.	Chinese consumption of foundry coke in 1997 was estimated to amount to 1.3-1.4 million mt.
Trade	The ratio of imports to consumption increased from zero in 1995-96 to 2 percent in 1997 before increasing to 11.3 percent in 1999 when imports reached 133,000 mt. The ratio of exports to production was 8 to 9 percent during the period, and exports were 107,000 mt in 1999.	No indication that China imports foundry coke. Exports of foundry coke in 1997 are estimated at 1.2-1.3 million mt. Industry representatives estimated that the three largest export markets for Chinese foundry coke in 1999 were Japan, the EU, and the United States.
Coke pricing	U.S. domestic weighted average contract unit values fluctuated during 1995-99, rising from about $176 in 1995 to $186 in 1998 before declining to about $176 in 1999.	C.i.f unit values of U.S. imports from China declined from about $123 per mt in 1997 to $108 in 1999.
Differences in product	U.S. quality considered superior. Chinese and U.S. foundry coke are generally “comparable” in terms of availability, delivery terms and times, discounts, packaging, product consistency, and reliability of supply.	Chinese foundry coke quality is considered inferior to that produced in the United States.

CHAPTER 1
INTRODUCTION

Foundry coke, a subgroup of metallurgical coke,[1] is the carbonized product remaining after blended bituminous coals are heated in an oven for a period of time. This product, which accounts for 5 to 7 percent of annual U.S. metallurgical coke production, is used primarily in the production of molten iron (e.g., gray iron) in a cupola furnace,[2] both as a fuel and as a source of carbon for the melted product. World capacity of foundry coke is estimated at 2 percent of total coke capacity; the relative capacity in the United States is about 7 percent.[3]

In the United States, the foundry coke industry currently comprises six firms,[4] all of which are merchant producers of this product. These firms produce foundry coke for sale on the open market or, in some cases, for use by subsidiary firms manufacturing primarily cast-iron products. Two of these foundry coke producers are owned by, or affiliated with, coal companies. The industry is concerned with, and is currently evaluating, a number of issues that could affect its competitiveness in the domestic market. Such issues include the age of the coke ovens; more stringent environmental regulations that must be met in the next few years; and increasing imports of foundry coke from the People's Republic of China (China).

Purpose and Scope

On August 25, 1999, the Commission received a letter from the House Committee on Ways and Means (the Committee) requesting the institution of a fact-finding investigation under section 332(g) of the Tariff Act of 1930, 19 U.S.C. §1332(g), to assess the current competitive conditions affecting the U.S. foundry coke industry with respect to the role of imports from the People's Republic of China (China) in the U.S. market.[5] The Commission was requested to submit its final report to the Committee within 1 year of receipt of the letter, or by August 25, 2000.[6]

In this report, the Commission, as requested by the Committee, reviews the foundry coke industries in the United States and China and provides information for the most recent 5-year period, to the extent possible, regarding the following: (1) production, consumption, and trade trends; (2) prices; (3) significant developments in foundry coke market practices such as coke quality specifications, cost recovery, pricing policies, and byproduct valuation; (4) market factors affecting the availability of foundry coke and purchasing decisions by coke-consuming industries; (5) costs related to compliance with environmental laws and policies; (6) costs of transportation to U.S. markets for Chinese and domestic foundry coke; and (7) other significant factors identified during the investigation.

Public notice of this investigation was posted in the Office of the Secretary, U.S. International Trade Commission, Washington, DC 20436, and published in the *Federal Register* (64 FR 51556) of September 23, 1999.[7] A public hearing was held on February 29, 2000, in Washington, DC.

Study Approach and Organization

The information used in this report was obtained from a variety of sources. The Commission conducted telephone and field interviews with representatives from domestic and Chinese foundry coke companies, with principal trade associations, with U.S. and Chinese Government officials, and with major trading brokers. These interviews were conducted in the United States and China. The Commission staff also

[1] The subgroups of metallurgical coke are blast furnace coke, foundry coke, and other industrial coke.

[2] See appendix E for the definition of this term, as well as others, used in this report.

[3] Estimates provided by a representative of the American Coke and Coal Chemicals Institute.

[4] Another firm produced a small amount of foundry coke in 1999 using some of its blast furnace ovens.

[5] A copy of the letter may be found in appendix A.

[6] On May 25, 2000, the Commission received a letter from the Ways and Means Committee requesting a change in the submission date of the final report to July 7, 2000. A copy of the letter may be found in appendix B.

[7] A copy of this notice is reproduced in appendix C.

used data and information obtained from a literature search of industry and Government publications. Where necessary, the Commission incorporated qualitative or anecdotal information in the absence of, or to supplement, quantitative data. Information was also compiled from Commission questionnaires, written submissions, and testimony from a public hearing held at the Commission on February 29, 2000.[8]

The Commission visited the six major U.S. foundry coke producers, several end users, and certain U.S. importers of Chinese foundry coke. Foreign fieldwork comprised interviews with several Chinese foundry coke producers, located primarily in Shanxi Province, as well as with certain Chinese officials involved with the coke industry, gathering information on Chinese government policies, such as environmental, labor, and input pricing policies, affecting the foundry coke industry.

Because of the lack of published data on the foundry coke industries of the United States and China, the Commission staff also sent out questionnaires to obtain data critical to this study. U.S. producer questionnaires were sent to eight domestic producers believed to have produced foundry coke during 1995-99; responses were received from all eight firms accounting for 100 percent of domestic production (one firm stated it did not produce or sell foundry coke during 1995-99). In addition, 15 foreign producer and 80 purchaser/broker/importer questionnaires were also sent and responses were received from 65 firms. These questionnaires accounted for 100 percent of the importers and firms accounting for 56 percent of total foundry product shipments into the United States. No foreign producer questionnaires were returned. The questionnaire data, along with information obtained from the above mentioned sources, were compiled to present an assessment of the conditions affecting the foundry coke industries in the United States and China.

This report to the Committee comprises four chapters. Chapter 1, an introduction to the report, provides information on the product and technologies involved as well as an overview of the global cokemaking industry, focusing on the United States and China. Chapter 2 presents information regarding the U.S. foundry coke industry during the most recent 5-year period for which data are available (1995-99), including the producers, patterns of ownership, structural changes in the industry, geographical distribution, production capacity, and capacity utilization. Additionally, this chapter discusses, to the extent possible, consumption, trade, sales, distribution, pricing methods, costs of inputs, production, transportation, environmental issues, and pertinent government policies for the foundry coke industry in the United States. Chapter 3 provides similar data and information on the Chinese foundry coke industry. Chapter 4 provides a comparative summary of major features of the U.S. and Chinese foundry coke industries and factors affecting the markets in the two countries. This chapter addresses various supply-side and demand-side factors such as production capacity, production costs, technology, transportation issues, and coke consumption. It also examines government policies such as environmental regulations, as well as market perceptions regarding differences between Chinese and U.S.-produced foundry coke.

[8] See appendix D for a list of witnesses.

Product Coverage and Production Technologies

Product Coverage

For purposes of this study, "coke" refers to metallurgical coke, which is the carbonized product remaining after the destructive distillation of certain types of coal heated in an oven for many hours or days depending upon the process. Metallurgical coke is composed of three subgroups, namely blast furnace coke, foundry coke, and other industrial coke.[9]

Blast furnace coke, also known as furnace coke, accounts for approximately 90 percent of annual U.S. coke production. It is used in blast furnaces to produce molten iron, which is further refined and alloyed to produce steel. Furnace coke is a very stable product able to withstand abrasion and breakage during handling and use in the blast furnace. This product has high porosity and is 1 inch to 3 inches in diameter for greatest furnace efficiency.[10]

Foundry coke, the subject of this study, is the other important subgroup of metallurgical coke accounting for 5 to 7 percent of annual U.S. coke production. This product is used primarily in the production of molten iron in cupola furnaces. The molten iron is then used to make various cast products such as automotive engines. In this process, foundry coke is used as a fuel to melt scrap or pig iron with other compounds and fluxes and as a source of carbon for the melted product.

[9] Industrial coke consists of undersized products remaining after the screening of furnace and foundry coke. This includes breeze and other small-sized foundry coke used in the production of a variety of products such as rock wool, beet sugar, calcium carbide, and smelting lead.

[10] Commission interviews with U.S. industry officials, Nov. 1999.

Foundry coke is relatively large, 4 inches or larger in maximum diameter. It must also have good strength and low ash content.

Foundry Coke Production Technologies

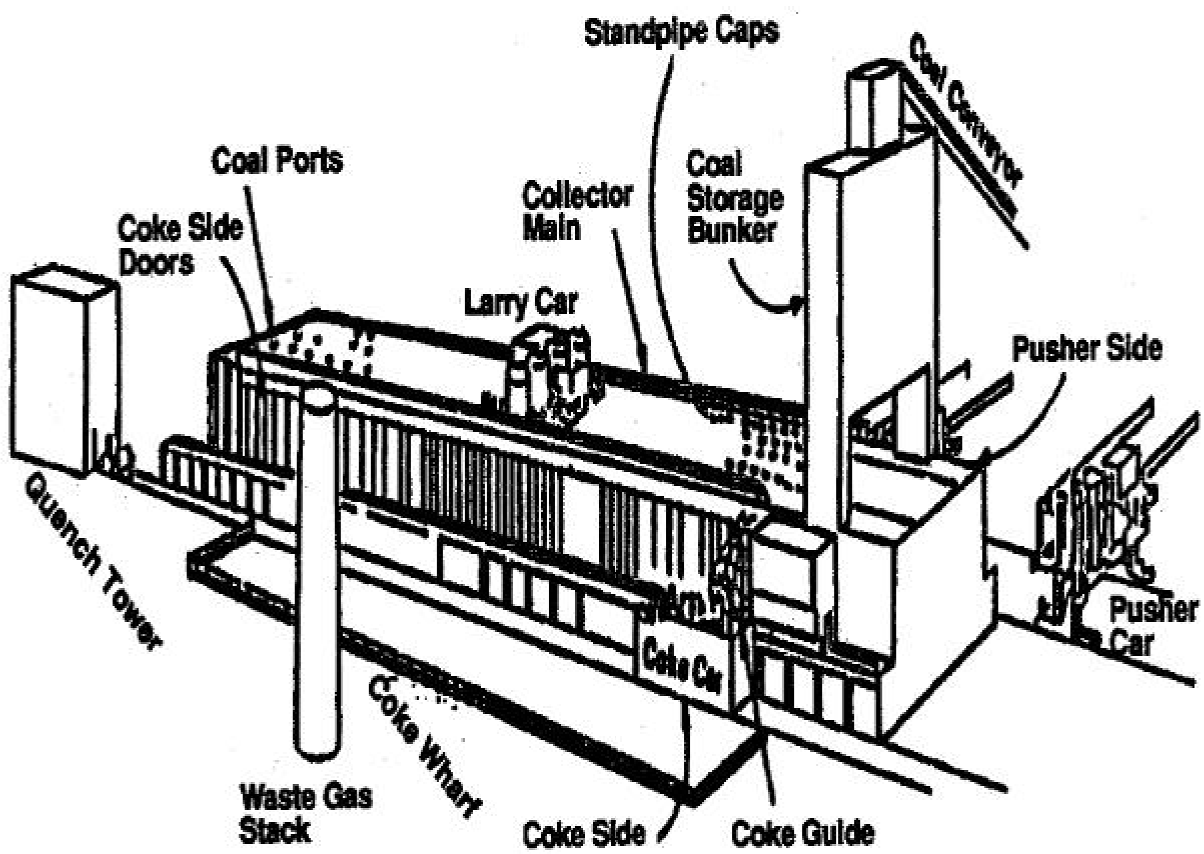
Foundry coke is produced worldwide, generally using one of two well-known and tested processes: the byproduct recovery process and the beehive process. In the United States, foundry coke producers use the byproduct recovery process. The older beehive process has not been used in the United States for the last 30 years, but is still used in several other countries, including China, as a major production method. Alternative cokemaking processes, such as the formcoke process and the use of jumbo ovens, have not found any significant niche in the current market. According to industry sources, formcoke did not have a significant enough economic advantage over the domestic foundry coke or the Chinese imports to warrant the process change. Regarding jumbo ovens, a domestic producer stated that the ovens were expensive to install and produced foundry coke that did not have the same desirable characteristics as coke produced in the smaller slot ovens.[11]

Byproduct Recovery Process

In the byproduct recovery process, coking coals are heated in a retort oven until the volatile materials evolve and are collected for further processing. The retort ovens, also called slot ovens because of their shape, are constructed in batteries containing 10 to 100 ovens in series (figure 1-1). The coking chambers alter-

[11] Commission phone conversations with a domestic producer and a foundry representative, May 2000.

Figure 1-1
Schematic of a slot oven coke battery



Source: U.S. Environmental Protection Agency.

nate with heating chambers so each oven is heated on each side, with the coking process proceeding from the sides to the center of the oven. After the coking coals are loaded into the oven, it is heated to 900_ to 1,100_C, usually for 26 to 32 hours. As the coking process proceeds, pressure builds, forcing the volatile compounds out of the oven through "offtake" pipes to the collecting main, where they are treated and separated for further processing.

After the coking process is completed, the doors on both ends of the oven are opened and a ram placed in front of one opening pushes the coke cake out the other side into a quenching car. At this point, the coke has a temperature of about 1,000_C and must be cooled before further processing. In the United States, the most common method for cooling the coke is wet quenching. In this operation, the quenching car containing the coke proceeds to the quenching tower, usually located at the end of the battery, where the hot coke is sprayed with water until cooled. The quenched coke is then brought to the coke wharf, where it is deposited for further cooling. The wharf is sloped, so the coke slides onto a conveyer belt at the bottom that moves the coke to the screening and loading operations.

Beehive Process

In the beehive process, crushed and blended coking coals are placed in a kiln lined with firebrick and ignited while restricting the air flow. The older dome-shaped ovens were usually built in single rows against an earthen bank or against another row of ovens.

Today, most of China's foundry coke production is produced in modified versions of the older beehive oven. The modified beehive versions are typically long, hollow, brick buildings, approximately 10-15 feet in height and 15-20 feet wide. These ovens are above ground, and are often lined together in groups of 10-100 and spaced approximately 10 feet apart (figure 1-2). These ovens are initially fired with gas fittings set underneath the ovens, and once going, the coking process is self-fueling. As the coal charge is heated, volatile gases liberated from the coal are ignited in the presence of air admitted to the coking chamber in controlled amounts to regulate the burning of these gases. The heat generated drives the coking process from the top of the coal downward. At the end of the process, the coke is cooled with water from manually operated hoses inserted through the door. After cooling, the coke is removed, either by hand or by motorized wheelbarrows, broken, and then screened to size. Coking time for foundry coke produced using the beehive process is about 8 to 11 days.[12] Several ovens are also connected to a common chimney that is used to disperse the waste emissions.[13] In China, beehive ovens are usually grouped in rectangular batteries each with 8 to 12 ovens.

Overview of the U. S., Chinese, and Global Coke Industries[14]

Global statistics on production and capacity of foundry coke are not readily available because the industry usually represents only a small portion of the total coke industry in a particular country. However, the major cokemaking countries typically produce foundry coke. The major countries believed to currently produce foundry coke are the United States, China, Russia, and Germany (the primary producer in the European Union (EU)). The largest global producer and exporter of foundry coke is China. In the cokemaking countries, production and capacity of foundry coke usually account for less than 2 percent of total coke production, and in some countries (e.g., Japan) foundry coke is no longer produced. In the United States, foundry coke production and capacity are estimated to be much higher than the global average of approximately 5-7 percent.

Industry sources estimate world production of foundry coke at approximately 2 percent of total coke production, or about 6.3 million metric tons. As the world's largest producer of foundry coke, China had a domestic capacity of about 2.9 million metric tons in 1997.[15] Price, quality, environmental regulations, and transportation costs are some of the factors believed to affect foundry coke production and consumption trends as well as overall coke trends. In addition, there are other factors that more specifically affect trends in foundry coke, such as demand in the foundry industry, the dominant end user. The trends in the foundry industry toward electric furnaces and nonferrous castings, as well as larger cupolas, may also affect foundry coke demand in the future.

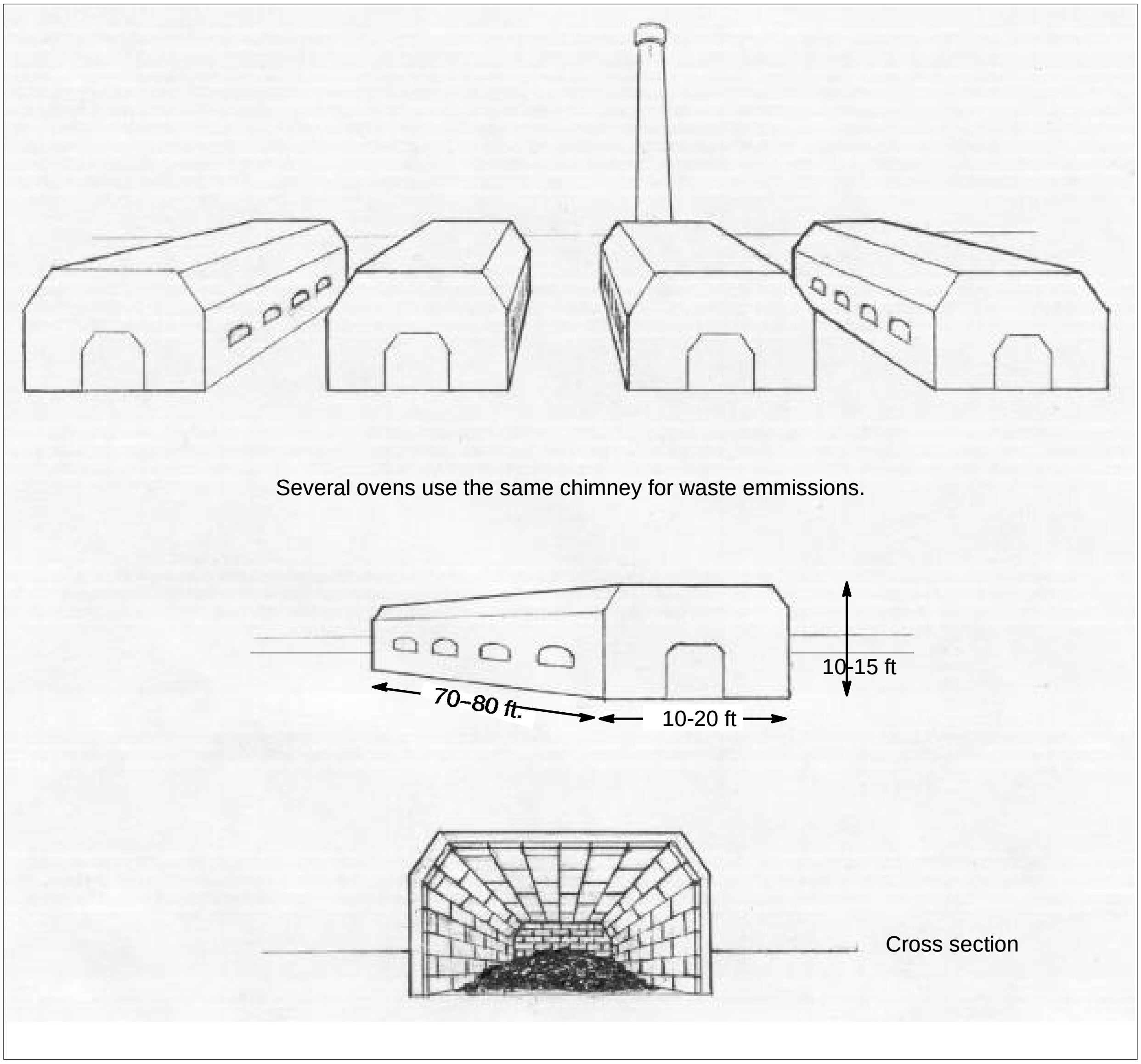
[12] Raoul Oreskovic, "The Emergence of China as a Major Coke Supply Source," paper presented at "Coping With the Tightening Coke Supply: Is a Crisis Looming?" Charlotte, NC, Mar. 5-7, 1997, p. 2.

[13] Commission fieldwork at several Chinese beehive coke plants in Shanxi Province and Inner Mongolia, March 2000.

[14] Where available, data for foundry coke are specified. Unless otherwise specified, capacity figures reflect capacity for all types of coke, not just foundry coke.

[15] B. Goswami, *Chinese Coke 1999 Directory,* pp. 76-110.

Figure 1-1
Modified beehive coke ovens in China



Source: Commission fieldwork in China, March 2000.

During 1992-96, total world cokemaking capacity rose from 395.1 million metric tons to 428.1 million metric tons, or by 8 percent due to increasing demand for ferrous casting and steel mill products (see table 1-1). The top three regions in 1996 were: Asia, 241.5 million metric tons; Europe, 141.3 million metric tons; and North America, 27.1 million metric tons. During 1992-96, capacity in the United States, the EU, and in the rest of Europe decreased, while capacity in certain Asian countries, especially China, expanded.

For a country to have a cokemaking industry, it must have significant reserves of coking coals, the main raw material in the production of all types of coke. In 1999, the United States had the world's largest recoverable reserves of coking coals, mainly different types of bituminous coal, followed by the Commonwealth of Independent States (CIS), India, and China (table 1-2).

United States

The U.S. coke industry has two sectors: integrated producers and merchant producers. Integrated plants, which produce coke for internal use in the production of molten iron for steel production, accounted for

Table 1-1
Coke, all types: production, capacity, and capacity utilization by regions, 1992, 1995, and 1996

Region	Production 1992	Capacity 1992	Capacity utilization 1992	Production 1995	Capacity 1996	Capacity utilization, 1995/1996[1]
	— Million metric tons —		Percent	— Million metric tons —		Percent
EU	48.23	50.17	96.1	39.32	40.82	96.3
Other European countries	88.22	116.79	75.5	70.96	100.48	70.6
China	79.85	87	91.8	135.01	147	91.8
Other Asian countries	77.49	91.09	85.1	79.51	94.52	84.1
North America	29.23	30.93	94.5	26.23	27.1	96.8
South America	9.72	10.57	92.0	9.48	10.61	89.3
Africa	6.83	8.51	80.3	5.99	7.54	79.4
World	339.59	395.06	86.0	366.57	428.07	85.6

[1] Capacity utilization during 1995-96 is defined as coke production (1995) divided by cokemaking capacity (1996). Production data for 1996 were not available when the table was compiled.

Source: International Iron and Steel Institute (IISI), *World Cokemaking Capacity,* Brussels, 1996.

Table 1-2
World recoverable reserves of coking coals, by type, 1999

(Billion tons)

Country	Anthracite & bituminous	Lignite & sub-bituminous	Total
United States	122	149	271
Commonwealth of Independent States	115	150	265
India	75	2	77
China	69	58	127
South Africa	61	0	61
Australia	50	50	100
Poland	30	14	44
Germany	26	48	74
All other	29	94	123
Total	577	565	1,142

Source: Derived from official statistics of the U.S. Department of Energy.

about 80 percent of total U.S. coke capacity in 1999. Merchant plants producing coke for sale on the open market accounted for the remaining 20 percent. All U.S. foundry coke producers fall within the merchant sector.

Annual capacity for furnace and foundry coke in the United States has been declining for almost two decades. During 1992-96, total domestic capacity of all coke continued to decline from 23.82 million metric tons to 21.49 million metric tons, or by 2.33 million metric tons. The United States reduced its coke capacity significantly when the Clean Air Act Amendments of 1990 (CAAA) was promulgated by the U.S. Government as a Federal regulatory framework and the U.S. Environmental Protection Agency (EPA) set regulations on air emissions during 1988-92. The industry is now approaching the second phase of Federal limitations on coke oven emissions, changes in wastewater effluent guidelines, and increased public reporting of toxic chemical production.[16] As a result, environmental compliance costs will increase in the future both in absolute terms and as a percentage of operating costs for U.S. foundry coke producers.[17]

[16] At the present time, these limitations are being completed.

[17] Testimony of Mr. Martin Dusel, Senior Vice-President, Citizens Gas & Coke Utility, at the Commission's hearing on Feb. 29, 2000.

The major consumers of foundry coke in the United States are the ferrous foundries manufacturing products for the automotive, railroad, machinery, farm equipment, and electrical equipment industries. The major factors affecting the U.S. foundry coke market are market consolidation by suppliers and purchasers, prices for both imported and domestic coke, reliability of supply, uniform quality, environmental regulations, and transportation costs. Also, trade of all coke, including foundry coke, historically has been limited because of transportation costs and the amount of breakage associated with transportation.

Total North American capacity for all coke is not expected to change dramatically in the near future. The cokemaking and ironmaking industries have largely adjusted to the environmental regulations of the 1990s. However, there are new air and water regulations the coke industry must comply with by 2003, and two of the six major foundry coke producers must meet stricter air-emissions thresholds or "standards" by 2003. Domestic foundry coke producers state that the construction of new capacity of foundry coke as well as all other cokes is hampered by uncertainty over future environmental regulations.[18]

China

It is difficult to obtain specific information on capacity, production, trade, and age of ovens for the coke industry in China. Moreover, data on foundry coke are seldom separately reported. The Commission staff obtained some specific data while on fieldwork in Shanxi Province and other parts of China.

Available data (through 1996) show a large increase in the capacity to produce all types of coke in China. The International Iron and Steel Institute (IISI) reports that capacity in China increased 69 percent during 1992-96, to approximately 147 million metric tons, roughly 7 times the U.S. capacity. Some of this increase was reportedly due to better statistics on the beehive type of cokemaking, which grew in importance during these years and currently accounts for approximately 50 percent of total Chinese capacity. One trend discussed further in chapter 3 will be the increasing role of Chinese environmental laws, some of which specifically call for the closure of less environmentally friendly coke ovens. One such regulation required all coke ovens built before 1978 to be closed by December 31, 1999. Although the level of enforcement is still to be determined, according to one U.S. industry representative, significant coke capacity (i.e, non-compliant beehive ovens) was shut down in China during 1999 owing to the environmental regulations. While on fieldwork in China, the Commission staff also observed numerous idle beehive ovens. Prices for all cokes in China are now increasing because of reduced supply and increasing worldwide demand. It was also stated that China's leading export markets in 1999 were Japan (750,000 to 800,000 metric tons of foundry coke), the EU (350,000 metric tons), and the United States (about 100,000 metric tons).[19]

Other Countries

Other producing countries have shown a sharp decline in cokemaking capacity, especially those in the EU, other European countries, and the CIS. Future declines in annual coke capacity are expected in these regions as the number of environmental regulations and enforcement increases. In the Asian Pacific region, there have also been significant changes in the coke capacity of several countries other than China. In Japan and Australia, coke capacity declined during 1992-96, while India, Iran, the Republic of Korea, and Taiwan posted increases. However, most of this added capacity is not foundry coke, but furnace coke. It is estimated that overall coke capacity in these Asian-Pacific countries increased by 4 percent during 1992-96. According to an industry source, Japan no longer produces foundry coke; it now purchases essentially all of its foundry coke requirements from China.[20]

Worldwide Capacity Utilization

Table 1-1 shows utilization of total coke capacity by specified regions. Worldwide, use of capacity remained steady at around 86 percent during the period of comparison. The highest rate was in North America (97 percent), closely followed by the European Union (96 percent). Data for China are estimates.[21]

Capacity and capacity utilization are affected by the age of the ovens used. As a general rule, the maximum age for coke batteries is approximately 35 years, with annual productivity losses of 1 to 3 percent after 15 years of operation. The age of an oven is a complicated issue that involves more than the number of years in existence; closures, rebuilds, and additions to capacity must also be taken into account. The average age of ovens is rising in most regions of the world; the

[18] International Iron and Steel Institute (IISI), *World Cokemaking Capacity,* Brussels, 1996.

[19] Commission interview with U.S. industry representative, Jan. 28, 2000.

[20] Commission interview with a U.S. industry representative, Mar. 2000.

[21] IISI, *World Cokemaking Capacity*, Brussels, 1996.

average age of Chinese ovens is not available. Chapter 3 addresses this question indirectly by looking at the age of plants in China. The age of a beehive oven is also of less significance than that of a slot oven because of the structure and process used to produce the coke.

During 1992-96, the average age of coke ovens in the European Union was 19.0 years, primarily because of plant closures containing older ovens in Germany, Belgium, France, and Italy. In other European countries, average oven age was about 17.0 years. Many ovens were closed in the CIS countries, Poland, and the Czech Republic. In Asia (excluding China) and the Pacific region during 1992-96, the average age of ovens increased by 3.0 years to 18.0 years. In North America, the average age of ovens was about 24.0 years.

CHAPTER 2
U.S. FOUNDRY COKE INDUSTRY PROFILE AND MARKET

During the past decade, the U.S. foundry coke industry has successfully met the needs of domestic consumers and the export market. The U.S. foundry coke producers have maintained ample capacity to meet the increasing needs of consuming industries despite currently facing a future dictated by uncertain costs, stringent environmental regulations, aging facilities, and increased competition from imports of foundry coke from China. Despite the challenges currently facing the domestic industry, U.S. foundry coke producers have been successful because of several factors including technological innovations to increase the lifespans of aging ovens, increased capacity, and the availability of high quality coking coals.

U.S. Industry Profile

U.S. Capacity and Production

Total foundry cokemaking capacity in the United States increased during 1995-99, primarily because of capital investments made by the foundry coke industry to retrofit, maintain, and improve efficiencies of aging batteries. The U.S. foundry coke industry is comprised of six merchant producers with the total 1999 capacity to produce about 1.6 million metric tons of foundry coke per year (table 2-1). During 1999, a seventh producer briefly entered the market, Acme Steel. Acme, an integrated steel producer, converted several of its blast furnace ovens, on a test basis, to the production of foundry coke, adding approximately 6,000 metric tons of production capacity to the total U.S. capacity to produce foundry coke. However, it is unclear whether Acme will continue to produce foundry coke on a consistent annual basis.

The majority of the coke oven batteries operating in the United States began operations in the 1940s and 1950s (table 2-1). Nearly all U.S. foundry coke capacity has reached or is nearing the 35 year average acceptable lifespan for coke oven batteries. During the lifespan of these batteries, the industry has replaced, repaired, and/or retrofitted ovens, depending upon their condition, to comply with environmental regulations. As a result, these ovens are lasting longer than their original lifespan estimation.[1] During the course of maintaining older ovens, the industry has developed various technologies, such as replacement brick for the oven walls, sealing techniques, and coal-mixing techniques, which are expected to further increase the lifespan of these ovens.[2]

In 1999, the U.S. producers of foundry coke operated a total of 14 batteries with a combined total of 605 ovens,[3] with production concentrated near Birmingham, AL (figure 2-1). The geographic location of the producers results from necessary proximity both to the location of foundries and the transportation infrastructure necessary to receive coal and to move the product from the production site to the end users. Foundry coke producers are located on established rail routes and within reasonable proximity to coal mines in West Virginia, Kentucky, Alabama, and Pennsylvania.

Overall foundry coke capacity increased by 3 percent during 1995-99, reaching 1.6 million metric tons in 1999 (table 2-2). The U.S. foundry coke producers have stated that they have no current plans to expand production or update current production facilities since current demand is less than current capacity.[4]

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[1] Commission interviews with U.S. foundry coke producers and importers, March 2000.

[2] Ibid.

[3] The 15 ovens of Acme Steel used to produce foundry coke during 1999 are included in the 605 ovens.

[4] The U.S. foundry coke producers have spent substantial capital in coal-blending facilities, screening facilities, and other technologies specific to the production of foundry coke but not necessary in the production of blast furnace coke; therefore, the foundry coke producers are not in an economic position to switch from the production of foundry coke to blast furnace coke. Post-hearing brief of the American Coke and Coal Chemicals Institute, exhibit 6, p. 1, Mar. 14, 2000.

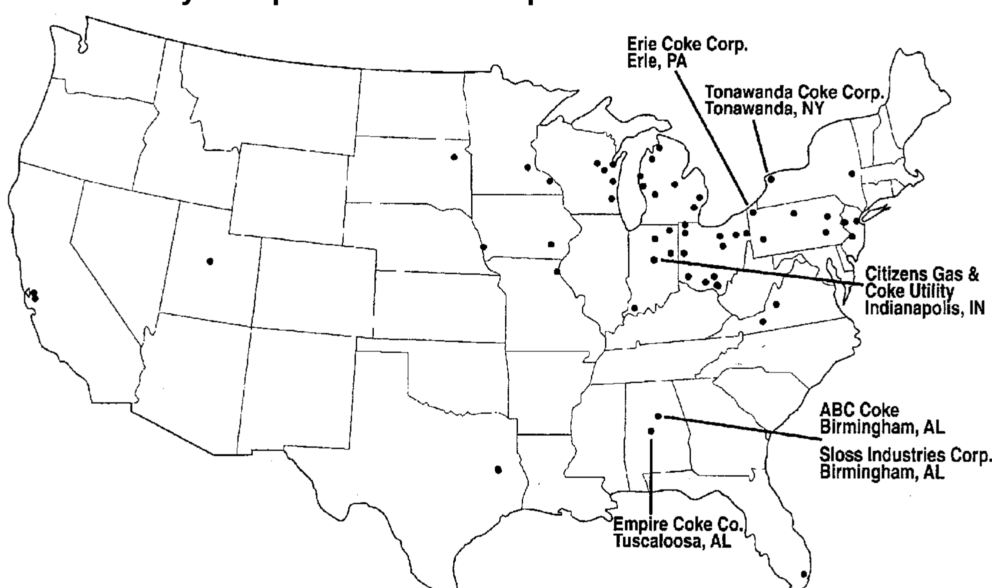
Table 2-1
U.S. foundry coke producers, 1999

Company	Location	No. of ovens per battery	Start-up date per battery	Total capacity[1]	EPA track[2]
				(1,000 metric fons)	
ABC Coke	Birmingham, AL	78	1968	440	L
		25	1953		L
		29	1953		L
Citizens Gas & Coke	Indianapolis, IN	47	1946	470	L
		41	1943		L
		72	1979		L
Empire Coke	Holt, AL	40	1941	105	L
		20	1941		L
Erie Coke	Erie, PA	23	1952	155	M
		35	1943		M
Sloss Industries	Birmingham, AL	30	1952	275	L
		30	1956		L
		60	1956		L
Tonawanda Coke	Tonawanda, NY	60	1962	183	M

[1] Total capacity figures are based on a yield of 52 percent of coke (4 inch or larger) to wet coal.
[2] The track selection under the provisions of the Clean Air Act: "M" refers to the MACT (Maximum Achievable Control Technology) Track and "L" refers to the LAER (Lowest Achievable Emissions Rate) Track. See the environmental section in this chapter for further information on track selections.1

Note.—In 1999, Acme Steel converted 15 of its 100 blast furnace ovens over to a test production of foundry coke (the 15 ovens do not constitute a full battery). In 1999, Acme's foundry coke capacity was approximately 6,000 metric tons.
Source: American Coke and Coal Chemicals Institute and various U.S. foundry coke producers.

Figure 2-1
Location of U.S. Foundry coke producers and U.S. producers



U.S. foundry coke producers are denoted by •———
U.S. purchasers of foundry coke are denoted by •

Source: Map detailing U.S. foundry coke producers provided by American Coke and Coal Chemicals Institute; points detailing U.S. purchasers compiled from responses to Commission questionnaires.

Table 2-2
Foundry coke: U.S. production, imports, exports, stocks, and consumption, 1995-99

Year	Active practical capacity	Production	Imports[1]	Exports	Stocks[2]	Consumption[3]	Ratio of imports to consumption	Capacity utilization
	1,000 metric tons						*Percent*	
1995	1,585.3	1,230	-	103	+8	1,119	([4])	77.6
1996	1,595.2	1,172	-	94	-11	1,089	([4])	73.5
1997	1,619.5	1,225	23	103	+5	1,140	2.0	75.6
1998	1,623.3	1,237	([5])	98	-6	[6]1,145	([5])	76.2
1999	1,634.6	1,248	133	107	+98	1,176	11.3	76.4

[1] Import data are derived from responses to the questionnaires of the U.S. International Trade Commission, except for Jan.-Apr. 2000, which are estimated from industry sources. During 1995 and 1996, there appear to be no imports of foundry coke; imports of foundry coke from China began to enter the U.S. market during 1997. While imports of foundry coke from China did enter the U.S. market during 1998, the data are not publishable.

[2] Stocks refer to the inventories on the ground. Data presented are the average annual change in stocks; therefore, "+" is an addition to stocks and is subtracted in order to obtain consumption; "-" is a stock draw down and is added in order to obtain consumption.

[3] Consumption is equal to production plus imports, minus exports, and plus or minus stocks (see footnote #2).

[4] Not applicable.

[5] Data are not publishable because to do so could disclose individual company business confidential information.

[6] Import data are not included in consumption.

Source: Data compiled from responses to Commission questionnaires and industry sources.

During 1995-99, capacity utilization rates fluctuated somewhat, but the increase in capacity caused utilization rates to decline from 77.6 percent in 1995 to 76.4 percent in 1999. U.S. production of foundry coke also fluctuated slightly during 1995-99, increasing overall by 1.5 percent to 1.25 million metric tons in 1999 (table 2-2). Data for January-April 2000 suggest that production may likely decrease for the year. Importers of foundry coke have suggested that the U.S. producers should switch to the production of blast furnace coke; however, U.S. producers stated that this is not feasible.[5]

Foundry Coke Co-products and Byproducts

During the production of foundry coke, various co-products and byproducts are produced and separated at the plant to be either used internally or sold for various industrial applications, including as feedstocks for the chemical industry.[6] The two main co-products are (1) breeze, the fine screenings that result from the crushing of coke and (2) other coke pieces that have been broken and no longer meet the size requirements of the foundries.

All of the U.S. foundry coke producers also produce byproducts. Byproducts produced during the coking process are crude materials such as crude coal tar,[7] crude light oil,[8] and coke oven gas.[9] Demand for some of the primary coke byproducts has declined, as these products can also be produced more efficiently and less expensively from crude petroleum. According to responding producers, a byproduct credit is generally taken for production of these byproducts (see financial performance section for further detail). Coke oven gas is generally used within the plant operations as a fuel source and coke breeze is either sold directly or mixed with coal and sold at market value.

U.S. Consumption

Foundry coke is primarily used in cupolas as a heat and carbon source for melting scrap iron and other additives to produce gray iron or ductile iron.[10] This molten iron is then used in the production of castings, which are contained in more than 90 percent of all manufactured goods and capital equipment.[11] Also, all sectors of the U.S. military use castings for tanks, trucks, and other applications.

There are approximately 2,900 foundries operating in the United States.[12] These foundries produce metal castings used mainly in the production of automotive and light trucks, including engine blocks, brake drums, and cam shafts, which account for about 35 percent of all metal castings shipped. Pipe fittings account for 15 percent of total shipments of metal castings and the remainder is accounted for by construction, mining and oil field equipment, valves, farm machinery, and municipal castings, such as manhole covers and grates, pumps and compressors, and other miscellaneous industrial uses.[13]

As noted in Chapter 1, the Commission received questionnaires from purchasers of foundry coke accounting for approximately 56 percent of total U.S. shipments of foundry products. Of the total purchasers responding to the Commission's questionnaires, 20 percent are located in Ohio, 14 percent in Michigan, 11 percent in both Pennsylvania and in Wisconsin, 9 percent in Indiana, 7 percent in New Jersey, and 5 percent in Virginia, with the remainder located in Alabama, California, Florida, Minnesota, Missouri, New York, South Dakota, Texas, and Utah. Of these purchasers, 39 percent are producers of various iron castings, 23 percent - automotive and industrial equipment, and

[5] See the section of this chapter entitled "Factors Affecting Foundry Coke Trends" for discussion of this subject. Commission interviews with U.S. foundry coke producers and importers, March, April, and May 2000.

[6] Production data for these products are not publicly available and data derived from Commission questionnaires are unpublishable as the data could divulge individual company business confidential data.

[7] Crude coal tar is refined into tar acid oils, soft pitch, creosote oil, road tar, and other products.

[8] Crude light oil is a mixture of aromatic hydrocarbons (benzene, toluene, and xylenes), as well as thiophene, mercaptans, hydrogen sulfide, and hydrogen disulfide. Additional refining separates the higher valued aromatic hydrocarbons from the other chemicals.

[9] Coke oven gas, which in the United States is generally more important in operating the coke facility or a related steel plant than as a product for sale, contains several components, with methane and hydrogen in the greatest proportion. These gases have approximately 50 percent of the heating value of natural gas and must be further processed before being used as a fuel. Within the foundry coking operations, the most valuable of the byproducts is coke oven gas which is used to produce electricity for plant operations or to heat the ovens. According to industry sources, coke producers consume about 90 percent of the coke oven gas produced.

[10] Gray iron is the oldest and most widely used form of cast iron because it is readily cast into intricate shapes and is easily machined as well as resistant to wear. Malleable iron, the type of cast iron least used for iron castings, is stronger than gray iron but is more costly than gray or ductile. Ductile iron is also readily cast into intricate shapes and is stronger than gray iron because of the addition of alloys during the casting process.

[11] Industry sources and *Facts & Figures About the U.S. Foundry Industry*, www.afsinc.org.

[12] Ibid.

[13] Ibid.

20 percent - cast iron piping, with the remaining producing acoustical ceiling tiles, mineral products, recycled lead alloys, and other metal castings.[14]

U.S. consumption of foundry coke fluctuated slightly during 1995-99 increasing slightly from 1.1 million metric tons in 1995 to 1.2 million metric tons in 1999 (table 2-2). U.S. imports as a share of consumption increased from 2.0 percent in 1997 to 11.3 percent in 1999 and to 15.8 percent during January-April 2000 (table 2-2). Total U.S. shipments of foundry coke remained relatively stable at 1.2 million metric tons during 1995-99 (table 2-3). However, shipments are likely to decrease during 2000, based on January-April data. Foundries accounted for 98.8 percent of total U.S. foundry coke shipments during 1995-99 with other industrial applications accounting for the remainder.

According to U.S. producers, demand for foundry coke remained relatively steady during 1995-97 but increased during 1998-99 primarily as a result of an increased demand for trucks and sport utility vehicles coupled with a strong housing market (utilizing pipe) brought on by a relatively strong economy. However, during 1995-99, some U.S. foundries closed and some converted to electric arc furnaces for melting purposes, thereby reducing potential consumption. Moreover, despite the strong economy, demand factors related to iron foundry products have been adversely affected by several factors including (1) the replacement of some iron automotive components with lighter weight materials such as aluminum or plastics to improve gasoline mileage, (2) replacement by the construction industry of some iron pipe with lower cost polyvinyl chloride(PVC) pipe, and (3) the net loss of cupola furnace melting capacity.[15] U.S. foundry coke producers reported that during the next 5 to 10 years, demand for foundry coke will probably decrease as smaller foundries shut down due to environmental regulations and product substitution. U.S. foundry coke producers have stated that, despite this trend, there is unused domestic capacity that can supply domestic demand.

[14] Data compiled from responses to Commission questionnaires.

Trade

U.S. imports of all types of coke enter the U.S. market free of duty. Prior to January 2000, the Harmonized Tariff Schedule (HTS) did not make distinctions as to the type of coke being imported, and as a result, there were no official statistics tracking U.S. imports of foundry coke.[16] U.S. exports of foundry coke have been and continue to be classified in the Schedule B in combination with blast furnace coke. Effective Jan. 1, 2000, the Committee for Statistical Annotation of the Tariff Schedules (the Annotation Committee) approved a statistical enumeration for foundry coke in the HTS designed to capture data for imported foundry coke as distinguished from other types of coke, such as blast furnace coke. HTS subheading 2704.00.00.10[17] describes foundry coke in terms of size (4 inches or greater) and shatter testing pursuant to ASTM D3038. The Annotation Committee also requested the American Coke and Coal Chemicals Institute (ACCCI)[18] to monitor the data generated by these changes and report

[15] Ibid.

[16] Prior to January 1, 2000, HTS item 2704 only distinguished coke for fuel use and other coke.

[17] HTS subheading 2704.00.00.10 describes foundry coke as "Coke and semicoke of coal larger than 100 mm (4 inches) in maximum diameter and at least 50 percent of which is retained on a 100-mm (4-inch) sieve after drop shatter testing pursuant to ASTM D 3038, of a kind used in foundries."

[18] The ACCCI is the trade association representing the domestic foundry coke industry.

Table 2-3
Shipments of foundry coke, 1995-99

Item	1995	1996	1997	1998	1999
			Quantity *(1,000 metric tons)*		
Shipments:					
Domestic[1]	1,122	1,088	1,188	1,146	1,126
Exports	103	95	105	98	107
Total	1,225	1,183	1,293	1,244	1,233
			Value *(million dollars)*		
Shipments:					
Domestic[1]	187	190	199	208	203
Exports	18	17	19	18	19
Total	205	207	218	226	222

[1] Includes internal consumption and transfers.

Source: Data compiled from responses to Commission questionnaires.

any potential problems.[19] The U.S. foundry coke industry embarked on a campaign to assist the U.S. Customs Service in recognizing foundry coke at the port of entry. However, despite these efforts, significant quantities of foundry coke entered the U.S. market without being captured under the new HTS subheading.[20] Therefore, as a result of the lack of statistical enumeration for foundry coke imports prior to 2000 and the inaccuracies of the official 2000 trade data, trade data presented in this report are derived from responses to the Commission's questionnaires. During 1997-99, the U.S. foundry coke trade surplus decreased from $18.1 million in 1995 to $3.9 million in 1999 (table 2-4).

Imports

There were no U.S. imports of foundry coke reported during 1995 and 1996.[21] U.S. imports increased from 23,000 metric tons in 1997 to 133,000 metric tons in 1999 (table 2-4). China was the source for all of these imports of foundry coke during 1997. In 1999, China accounted for vitually all U.S. foundry coke imports with a small percentage coming from Canada.[22] During the period, the average unit value of U.S. foundry coke imports from China decreased from $123.42 per metric ton in 1997 to $108.26 per metric ton in 1999.[23] However, foundry coke producers and purchasers stated that the unit value of imports from China during 1998 was less than $100.00 per metric ton.[24] During January-April 2000, an estimated 65,000 metric tons of foundry coke from China entered the U.S. market and it is estimated that at the current levels, U.S. imports of Chinese foundry coke will likely exceed 1999 levels during 2000.[25]

Exports

U.S. exports of foundry coke fluctuated slightly during 1995-99 ranging from a low of 94,000 metric tons in 1996 to a high of 107,000 metric tons in 1999 (table 2-4). During January-April 2000, U.S. exports of foundry coke were 35,000 metric tons; interim data suggest that total exports in 2000 should remain relatively stable, at the 1999 levels. During the period, the unit value of U.S. exports ranged from a low of $176.06 per metric ton in 1995 to a high of $181.33 per metric ton in 1996; during January-April 2000, the unit value of U.S. foundry coke exports was $178.60 per metric ton. The major markets for total U.S. exports of coke during 1995-2000 were Canada and Mexico, with some shipments to Central America. According to industry sources, Chinese coke has not affected U.S. exports of foundry coke but these sources anticipate that Chinese coke could begin entering these other markets at anytime.[26]

Production Costs

U.S. foundry coke producers' calculated costs per metric ton of production are presented in table 2-5. The cost of raw materials increased by 2 percent from $88.51 per metric ton of production in 1995 to $90.22 per metric ton of production in 1999. Raw materials generally account for approximately 65 percent of the total cost of production. Direct labor costs increased by 14 percent during 1995-99, energy costs increased by 24 percent, and other costs associated with the costs of goods sold increased by 15 percent during the period covered. Credits for sales of associated byproducts, coke breeze, and/or industrial coke increased by 13 percent. Overall, the total costs associated with production of foundry coke in the United States increased by 7 percent from $129.30 per metric ton in 1995 to $137.86 per metric ton in 1999.

Transportation Costs

The vast majority of domestically produced foundry coke is consumed at facilities adjacent to or

[19] Letter from the Committee for Statistical Annotation of the Tariff Schedules to Mr. Roger M. Golden, Esq., representing the ACCCI, Dec. 20, 1999.

[20] The U.S. Department of Commerce, U.S. Census Bureau, reviewed data on all entries of coke which may have entered the United States since the revisions to the HTS took effect to determine whether improper classification occurred and concluded that some shipments of foundry coke may have been misclassified. The U.S. Census Bureau is working with the foundry coke industry, the U.S. Customs Service, and the U.S. International Trade Commission in an effort to develop more specific criteria to aid Customs officials in the classification of foundry coke imports. (Letter from the U.S. Department of Commerce to the Honorable Spencer Bachus, May 24, 2000, letter from David A. Saunders, President, ACCCI to the U.S. Department of Commerce, May 16, 2000, and letter from the U.S. Department of Commerce, U.S. Bureau of Census to the U.S. International Trade Commission, June 13, 2000.)

[21] Data compiled from responses to Commission questionnaires.

[22] See section entitled "Factors Affecting Foundry Coke Trends" in this chapter for a discussion of the reasons for these trends.

[23] Data compiled from responses to Commission questionnaires.

[24] Commission interviews with U.S. foundry coke producers and other industry sources.

[25] Based on estimated data provided by U.S. foundry coke producers and other industry sources.

[26] Commission interviews with U.S. foundry coke producers, various dates.

Table 2-4
Foundry coke: U.S. imports, exports, and trade balance, c.i.f., 1995-99

Year	U.S. imports[1]	U.S. exports	U.S. trade balance
	1,000 metric tons		
1995	0	103	103
1996	0	94	94
1997	23	103	82
1998	([2])	99	([2])
1999	133	107	-26
	1,000 dollars		
1995	0	18,134	18,134
1996	0	17,045	17,045
1997	2,840	18,578	15,738
1998	([2])	17,708	([2])
1999	15,021	18,923	3,902
	Per metric ton		
1995	0	$176.06	([3])
1996	0	181.33	([3])
1997	$123.48	180.37	([3])
1998	([2])	178.87	([3])
1999	112.94[4]	176.85	([3])

[1] During 1997 and 1998, China was the sole source of U.S. imports of foundry coke; however, during 1999, a small shipment of foundry coke was imported from Canada.
[2] Data are not publishable because to do so could disclose individual company business confidential information.
[3] Not applicable.
[4] During 1999, the unit value for imports of foundry coke from China was $108.26 per metric ton.

Source: Data compiled from responses to Commission questionnaires.

Table 2-5
Foundry coke: U.S. producers' production costs per metric ton of foundry coke for selected items, 1995-99

Item	1995	1996	1997	1998	1999
	Per metric ton of production[1]				
Raw materials[2]	$88.51	$91.43	$91.34	$92.93	$90.22
Costs of goods sold:					
Direct labor	22.35	24.20	24.68	24.84	25.58
Energy costs	4.76	5.89	6.40	5.09	5.90
Other costs[3]	42.49	45.70	47.85	48.99	48.71
Credits[4]	(28.81)	(32.94)	(36.94)	(34.56)	(32.55)
Total	129.30	134.28	133.33	137.29	137.86

[1] Production costs were calculated as the costs per ton of actual production in each year and may not reflect actual costs.
[2] Includes metallurgical coal, process water, sulfuric acid, lime, and caustic soda. The average price of coal per metric ton of foundry coke production in 1999 was $58 to $65 (delivered).
[3] Includes depreciation, amortization, and other factory costs associated with foundry coke production not elsewhere reported.
[4] Includes credits for sales of byproducts, coke breeze, coke oven gas, etc.

Source: Data compiled from responses to Commission questionnaires.

relatively near coke plants, and therefore is shipped anywhere from a few hundred yards to a few hundred miles. Most domestic shipments travel between 100 and 1,000 miles.[27] Industry sources stated that because transportation costs can account for 10 to 15 percent of the total delivered cost,[28] proximity to the coke producer, transportation costs, and reliable delivery are key purchase factors for U.S. coke consumers.[29] These costs vary widely, depending on distance, mode of transport, quantity shipped, and the negotiated terms of the particular contract.

Like the majority of all bulk product transported in the United States, shipments of foundry coke occur under specific contracts. Approximately 75 percent of U.S. producers' shipments of foundry coke were on a contract basis, with the terms of transportation built into the contract.[30] Contracts may range from multi-year contracts to spot agreements for as few as 2 to 3 months, or for a single shipment. Actual rates for truck, rail, and barge transport vary by company, depending on contract provisions and competitive factors present in each transportation market segment. However, U.S. coke producers note that, in order to compete effectively, they will often equalize freight costs. The policy is to be competitive on a delivered basis within a specific geographic area; moreover, many purchasers buy "delivered."

In 1999, nearly 45 percent of producers' reported foundry coke shipments were transported by rail, while 53 percent were transported by truck.[31] The remainder were transported by some combination of rail and truck.[32] The average shipping price to deliver a single metric ton of coke to the purchaser was approximately $24.81 (table 2-6).[33] Estimated rail transport[34] costs for the preponderance of movements range from $14 to $25 per metric ton, while truck rates generally begin at approximately $20 per metric ton, although lower rail rates may prevail in the case of dedicated short-line traffic and intra-company transfers.[35] U.S. foundry coke transportation costs, by mode, are shown in table 2-7.

Although barge transport costs, where available, are considerably lower than for comparable rail shipments,[36] barges are not generally used for shipping domestically produced foundry coke because of small shipment size. Larger loads of imported coke may be transported by barge from the port of entry to inland destinations in the United States, thereby allowing certain U.S. importers to obtain imported coke with lower intra-United States transport costs.[37]

Changes in domestic consumer supply patterns have influenced the increased use of imports, particularly from China. Because the remaining U.S. foundry coke producers are all located east of the Mississippi River, (two are located on the Great Lakes, three in Alabama, and one is located in central Indiana), a purchaser located on the west coast is at a significant geographic disadvantage vis-a-vis purchasers located on the east coast, and a contract with a domestic producer often entails considerableshipping distances and costs. It is generally less expensive for West Coast purchasers to purchase imported Chinese foundry coke than to purchase foundry coke from U.S. producers located more than 1,000 miles away. U.S. rail rates to ship domestically produced foundry coke such a distance, from east of the Mississippi River to the West Coast, can easily exceed $60.00 per metric ton.

A number of foundries purchase Chinese coke from brokers importing through several U.S. ports, including Richmond, CA; New Orleans, LA; Camden, NJ; and Wilmington, DE. As is the case with domesti-

[27] Over 27 percent of reported foundry coke shipments, by quantity, were transported less than 100 miles; approximately 52 percent were transported between 100 and 1,000 miles; the remainder more than 1,000 miles. Compiled from responses to Commission questionnaires.

[28] Data compiled from responses to Commission questionnaires.

[29] Commission interviews with U.S. foundry coke producers, March and May 2000.

[30] Data compiled from responses to Commission questionnaires.

[31] Ibid.

[32] Although the preferred mode of transport for many bulk commodities within the contiguous United States is rail, transport costs by rail for foundry coke are generally 10 to 20 percent higher than for blast furnace coke, due to lower volume and intermittent traffic patterns. Therefore, many of the shorter and smaller movements of foundry coke are trucked, despite higher per-mile trucking costs for bulk commodities. Commission interviews with U.S. foundry coke producers.

[33] Based on data provided by purchasers, weighted by shipments, and averaged across all modes and distances. Transportation costs are estimated based on questionnaire data. Estimates are used because, in most cases, data lack comparability. Many significant shipping price factors differ from contract to contract, and foundry coke prices may be quoted delivered or F.O.B.

[34] Transportation costs by rail and barge were estimated based on staff fieldwork, and from interviews and data submitted by transportation industry officials.

[35] Although lower rail rates also may be obtained through the use of unit trains (50 or more cars), this is not usually possible for the characteristically smaller shipment-sizes for foundry coke.

[36] Barge rates range from $3 to $13 per metric ton. Rail transport costs for a distance of less than 500 miles average $23 per metric ton.

[37] Although additional handling from barge or vessel unloading results in increased breakage, the amount lost from breakage is more than offset by decreased transportation costs.

Table 2-6
Foundry coke: Weighted average of U.S. transportation costs, for all modes, 1999

Source	U.S. dollars per metric ton
U.S. produced:	
For distances up to 100 miles	$12.26
100 miles to 500 miles	23.72
Over 500 miles	38.45
U.S. average for all distances	24.81
Foundry coke imported from China:	
U.S. average from port to foundry	20.03

Source: Data compiled from responses to Commission questionnaires.

Table 2-7
Foundry coke: Weighted average of U.S. shipments, by modes of transportation, 1999

Mode	U.S. shipments
	Percent
Truck	52.6
Rail	44.9
Combination	2.3

Source: Data compiled from responses to Commission questionnaires.

cally produced foundry coke, inland transportation costs depend on the mode of transport and distance traveled. For example, a purchaser located near the Mississippi River can take advantage of inexpensive barge rates for inland transportation. Other purchasers of imported coke may be able to take advantage of rail rates, and still others may have to have their purchases trucked from the port or storage facility. Any interim movements such as transloading, transshipment, or storage entail additional costs. For example, wharfage and stevedoring can add substantially to the delivered price, and storage charges at each port differ significantly. Local trucking rates also vary, with California's trucking rates reportedly substantially higher than most other areas. Ancillary charges applied at the port of entry, plus unloading charges, can, at times, range from $20-$30 per metric ton.

Financial Performance

The U.S. industry's net sales of foundry coke increased by 8.5 percent from $204.6 million in 1995 to $222.2 million in 1999 (table 2-8). Approximately 90-93 percent of total sales are sold on the open market at market prices while the remaining share is transferred at a lower cost to associated operations. Net income (before taxes) increased by 11 percent from $34.7 million in 1995 to $38.4 million in 1999. After taxes, net profits increased by 5 percent from $23.8 million in 1995 to $25.0 million in 1999.

Net profits for the foundry coke industry showed an overall increase during 1995-99 following the pattern for foundry coke prices. Net profits reached $32.6 million in 1998 when energy prices had dropped from the levels of the previous years, which offset a slight increase in raw materials costs and a decline in byproduct credits. In 1999, net profits declined by 23 percent from 1998 levels tracking a 2 percent decline in sales, a 3 percent increase in labor costs, a 16 percent increase in energy costs, and a 6 percent decline in byproduct credits; offset by only a 3 percent decline in raw materials costs. Profitability, measured as the return on sales, generally followed the trend of net profits and ended the period at 11.3 percent in 1999. Profitability, as measured by profitability per ton of foundry coke produced, declined slightly from 5.2 percent in 1995 to 5.0 percent in 1999, but averaged 4 percent during 1996-98 (table 2-9).

New capital expenditures increased from $14.1 million in 1995 to $19.8 million in 1997 before declining to $13.0 million in 1999. Research and development expenditures increased from $117,000 to $1.4 million during the period (table 2-10).

During 1995-97, the increase in capital expenditures was due to the focus on environmental concerns leading up to the 1998 deadline on air emissions[38] while the focus of firms' expenditures during 1998-99 shifted slightly to improved operating efficiency and facility maintenance. Significant capital expenditures would be necessary to rebuild existing batteries or to construct new batteries; currently, only one domestic

[38] For a discussion of water regulations, See "Environmental Costs" section of this chapter.

Table 2-8
Foundry coke: Income and costs of operations, 1995-99

(1,000 dollars)

Item	1995	1996	1997	1998	1999
Total net sales	204,630	207,244	215,385	226,566	222,177
Cost of goods sold	159,034	157,368	163,320	168,597	172,037
Gross profit	45,596	49,876	52,065	57,969	50,140
General, selling, administrative expenses	10,174	9,429	9,976	10,705	11,549
Operating income	35,422	40,447	42,089	47,264	38,591
Other income or (expenses):					
Interest or (expenses)	(954)	(769)	(1,015)	(1,035)	(706)
All other income items	760	931	1,869	1,814	5,533
(All other expense items)	(577)	(674)	(1,858)	(1,937)	(5,000)
Total other income or (expenses)	(771)	(512)	(1,004)	(1,158)	(173)
Net income or (loss) before taxes	34,651	39,935	41,085	46,106	38,418
Depreciation/amortization	10,880	11,108	11,886	13,518	13,402
Net profit	23,771	28,827	29,199	32,588	25,016

Source: Data compiled from responses to Commission questionnaires.

Table 2-9
Foundry coke: Profitability of U.S. producers, 1995-99

(Percent)

Item	1995	1996	1997	1998	1999
Profitability:					
Return on sales	11.6	13.9	13.6	14.4	11.3
Sales profitability per ton of coke production	5.2	4.1	4.2	3.8	5.0

Source: Data compiled from responses to Commission questionnaires.

Table 2-10
Capital and research and development expenditures and reasons for expenditures, 1995-99

	1995	1996	1997	1998	1999
Item:	*(1,000 dollars)*				
New capital	14,073	12,302	19,792	13,759	12,953
Research and development	117	111	107	107	1,428
	(Number of companies reporting)				
Reasons for capital expenditures:					
Facility maintenance	6	6	6	6	6
Improved operating efficiency	4	6	6	5	5
Environmental control	6	6	6	5	6

Source: Data compiled from responses to Commission questionnaires.

producer has plans to build a new battery to replace older ones currently in operation.[39] Generally, foundry coke producers have spent, and plan to continue to spend, considerable capital on maintenance and rehabilitation of older facilities to lengthen their lifespan far beyond that originally expected.[40] Research and development expenditures increased significantly from $117,000 in 1995 to $1.4 million in 1999, primarily in the areas of environmental control and increased oven lifespans (table 2-10).

[39] Industry sources estimate that construction of a 70-oven battery in the United States in 1998 would have cost about $200-250 million. (Commission interview with U.S. foundry coke producers.)

[40] Commission interview with U.S. foundry coke producers, various dates.

Factors Affecting Foundry Coke Trends

Market Dynamics

The U.S. producers reported that the major issues facing U.S. foundry coke production during 1995-99 were market consolidation, increased volumes of lower priced imported foundry coke, the need for uniform quality, and transportation and environmental costs. Also, the historical supply patterns in the U.S. market have changed due to excess capacity in a domestic market with flat demand and increased import competition.

The U.S. foundry coke industry currently has excess capacity that is sufficient to meet current domestic demand as well as projected future demand. However, such capacity cannot be altered readily to produce other types of coke. The industry is unable to shift to the production of blast furnace coke because existing foundry coke ovens are old and the shorter coking times required for blast furnace coke production would cause extensive damage that could not be repaired to the oven walls. Another supply consideration is the level of inventories or stocks; large inventories of foundry coke are generally not maintained on the ground because to do so would result in excessive breakage. Also, the U.S. industry cannot easily shift its production to other markets since transportation costs would be prohibitive.

U.S. producers, importers, and purchasers agree that there are no substitutes for foundry coke in most applications and that the share of the total cost of the end products accounted for by foundry coke varies by usage.[41] U.S. purchasers also agreed that there will be a continued need for foundry coke in their future operations.[42] U.S. purchasers further stated that any substitution of domestic foundry coke with Chinese foundry coke was based on a desire for a lower quality foundry coke at low prices.[43] Despite the quality differences between U.S.-produced and Chinese-produced foundry coke, some U.S. purchasers stated that the low price of the imported product makes it somewhat attractive to use or, to some extent, to blend with the U.S. product in their operations.[44] However, these same purchasers reported that if domestic prices were lowered to the level of imports, they would purchase the higher quality domestic foundry coke instead of the Chinese imported foundry coke.

U.S. producers reported that imported Chinese foundry coke can be physically used for the same applications as U.S.-produced foundry coke and is, therefore, generally interchangeable. However, Chinese foundry coke is not substitutable for U.S.-produced foundry coke in all applications. The typical grade of imported Chinese foundry coke produced in beehive ovens has both positive and negative factors associated with its use when compared with U.S. foundry coke produced in slot ovens. As a result, some end users have made minor changes to cupola startup procedures and monitored the cupola during its operation to accommodate Chinese coke.[45]

Purchasing Decisions

U.S. producers, importers, brokers, and purchasers were asked a series of questions to determine what factors influenced the decisions of customers when purchasing foundry coke.[46] Information obtained from these sources indicates that quality (chemical composition and consistency) and price were the most important factors affecting purchasing decisions (table 2-11). All of the U.S. purchasers who used Chinese coke generally agreed that while quality is important, price was the most important factor affecting their decision to purchase Chinese foundry coke. Approximately 86 percent of responding importers, brokers, and purchasers agreed that the price of U.S.-produced foundry coke was higher than the price of Chinese coke, about 75 percent agreed that U.S.-produced coke is considered to be superior in terms of quality. U.S. importers, brokers, and purchasers of foundry coke were asked a variety of questions to determine whether changes in demand for foundry coke impacted the U.S. supply situation. Approximately 82 percent of foundry coke purchasers reported that no decrease of their foundry coke consumption is planned over the next 5 years; 18 percent reported that they plan to use more oxygen enrichment in their melting process because of the introduction of more lower quality Chinese coke. Approximately 50 percent of foundry coke purchasers also reported that they were not considering any new technologies or operating procedures nor were they planning to replace or displace the use of foundry coke in their operations. Importers and brokers reported that only 9 percent of their customers specifically request foundry coke from China instead of purchasing U.S.-produced foundry coke.

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[41] Data compiled from responses to Commission questionnaires.
[42] Ibid.
[43] Ibid.
[44] Ibid.
[45] Ibid.
[46] It is estimated that purchasers responses to the Commission's questionnaires captured nearly 56 percent of total shipments of foundry products and nearly 100 percent of total imports of Chinese coke.

Table 2-11
Foundry coke from United States compared with China

Factor	Superior	Comparable	Inferior
		Percent	
Ash content	63	33	4
Availability	21	72	7
Delivery terms	34	52	14
Delivery times	35	55	10
Discounts offered	11	56	33
Lowest price[1]	7	7	86
Minimum quantities	29	64	7
Packaging	17	83	0
Product consistency	30	48	22
Quality	75	25	0
Product range	31	65	4
Reliability of supply	50	46	4
Technical support	65	21	14
Transportation network	25	64	11
U.S. transportation costs	7	72	21

[1] A rating of "superior" means that the U.S. price is lower and a rating of "inferior" means that the U.S. price is higher.

Source: Data compiled from responses to Commission questionnaires.

Coke Pricing

U.S. Produced Foundry Coke

U.S. foundry coke sales are generally based on long-term contracts, which accounted for 83 to 87 percent of total sales during 1995-99 (table 2-12). Individually, U.S. producers reported that sales based on long-term contracts accounted for between 60 and 98 percent of their firms' sales of foundry coke, with spot market sales accounted for between 2 and 40 percent.[47] U.S. producers reported that most contracts range in length from 1 to 3 years with prices negotiated each year. Contract prices are usually determined on a transaction-by-transaction basis with discounts offered to large volume customers. Some producers publish price lists for their foundry coke while others do not. In terms of spot market sales, prices are established based on competitive market factors.

Of the total responding importers, brokers, and purchasers, 98 percent reported that U.S.-produced foundry coke unit values were higher than unit values for Chinese foundry coke. Domestic contract prices increased from an average of $175.81 per metric ton in 1995 to $185.74 per metric ton in 1998. However, U.S. producers lowered contract prices to $176.12 per metric ton in 1999 (table 2-12).[48] Spot market prices for domestic foundry coke followed the same pattern, as is typical, but were generally higher during the period (table 2-12).

U.S. foundry coke producers reported that they have made price concessions to customers in order to be more price competitive with foundry coke imported from China.[49] Of the total responding importers, brokers, and purchasers, 81 percent anticipated that future prices for U.S.-produced foundry coke would continue to be higher than prices for Chinese foundry coke; 14 percent anticipate that prices would be similar or the same; and 5 percent reported that U.S. prices would likely be lower than Chinese prices in the future.

U.S. Imports of Foundry Coke from China

A total of 24 firms reported purchases of Chinese foundry coke during 1997-99. Of these, 10 percent produced iron castings and 7 produced pipe, neither of which requires the sophisticated level of metallurgy that is necessary in certain other applications; 5 produced automotive and other industrial equipment, and 2 produced metal castings and other mineral products.[50]

Approximately 50-55 percent of the total U.S. imports of Chinese foundry coke sold to purchasers was on a contract basis in 1999. Generally, these contracts are short-term, 3 to 6 months or one year.[51] U.S.

[47] Data compiled from responses to Commission questionnaires.

[48] Ibid.

[49] Ibid. and Commission interviews with U.S. foundry coke producers, March and May 2000.

[50] Ibid.

[51] Ibid.

Table 2-12
Foundry coke: Weighted average unit values, net f.o.b., for contract and spot market, as reported by U.S. producers by quarters, 1995-99[1]

Period	Contract sales to U.S. customers		Spot market sales to U.S. customers	
	Quantity	Unit Value	Quantity	Unit Value
	1,000 metric tons	*Per metric ton*	*1,000 metric tons*	*Per metric ton*
1995:				
January-March	128	$174.05	30	$183.30
April-June	141	176.68	27	182.33
July-September	130	175.85	27	185.85
October-December	126	176.60	23	176.30
Total	525	175.81	107	182.20
1996:				
January-March	131	$179.98	23	$161.17
April-June	133	180.77	23	173.26
July-September	129	180.77	24	180.00
October-December	127	182.54	23	185.09
Total	520	181.01	93	174.94
1997:				
January-March	137	$184.31	22	$186.91
April-June	148	183.76	20	185.70
July-September	133	184.05	21	186.29
October-December	139	183.91	18	179.72
Total	557	184.00	81	184.85
1998:				
January-March	151	$186.14	20	$184.85
April-June	149	186.01	17	199.53
July-September	141	185.18	18	196.33
October-December	140	185.49	17	185.41
Total	581	185.74	72	191.32
1999:				
January-March	153	$185.37	17	$189.29
April-June	149	184.24	19	182.37
July-September	145	172.34	22	189.23
October-December	80	150.16	22	188.18
Total	527	176.12	80	187.33

[1] Includes U.S. sales to end users and brokers.

Source: Data compiled from responses to Commission questionnaires.

purchasers of foundry coke from China reported that contracts are usually for a fixed quantity and/or price and that approximately 50 percent of these contracts specify penalties for material that does not meet specifications.[52]

Cokemaking and the Environment

During the 1990s, the coke industry implemented Federal limitations on coke oven emissions of hazardous air pollutants and invested in equipment and processes to meet regulations covering other air pollution emissions, wastewater discharges, and solid wastes. The industry is now approaching a second phase of Federal limitations on coke oven emissions, changes in wastewater effluent guidelines, and increased public reporting of toxic chemical production. At the time of the Commission's study of the metallurgical coke industry in the early 1990s, of which the foundry coke producers are a part, the costs of complying with the increasingly stringent environmental regulations were considered by the industry to be likely to reduce the

[52] Ibid.

future competitiveness of the coke industry.[53] For the U.S. foundry coke producers, pollution abatement control expenditures are currently a significant portion of the cost of production of their basic product, and pending changes in both air and water pollution abatement requirements may add to these costs.

Air-Pollutant Emissions

The ovens at a coke operation, as well as the byproduct plant, are affected by two types of air pollution regulations. The first type addresses the quality of the ambient air in the regions in which the plants are located and focuses on seven constituents: ozone, volatile organic chemicals (VOCs), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide, particulate matter, and lead.[54] Regions of the country are in either attainment or non-attainment status depending upon the atmospheric level of the constituent. If a foundry coke plant is in a region that is in non-attainment status for one or more of the seven constituents, the plant may have to take additional steps to reduce its emissions related to that constituent. The foundry coke plant in Indiana, Citizens Gas & Coke Company, and the plant in Pennsylvania, Erie Coke Corporation, are in attainment areas for all seven constituents. The others, Tonawanda Coke Corporation in New York, and the three in Alabama, ABC Coke, Sloss, and Empire are in areas that are in non-attainment status owing to high levels of ozone.[55] However, this non-attainment status reportedly does not affect the operations of the coke facilities, as the technologies (i.e., gas blanket) employed to maintain VOC levels in the byproduct plant also control the plants' contributions to the ozone levels in the regions.[56]

The more recent regulations focused on the hazardous pollutants emitted from byproduct coke ovens that are not collected by the byproduct recovery process. Since there is relatively high positive pressure within byproduct coke ovens during the coking process, the doors, lids, and offtakes tend to leak; the primary health concern relates to benzene and other known or suspected carcinogens that occur in coke oven gas. Temperature, type of coal, time into the coking cycle, pressure fluctuations, or other differences between batteries cause variations in the levels and concentrations of pollutants emitted.[57] Other factors that affect emissions include the age of the battery and its maintenance program.

Given the difficulties in measuring the quantity of these emissions, pollution from coke ovens is generally expressed in the United States in qualitative terms, or occurrences, and not in quantitative terms. Emissions are measured by observing the percentage of doors, lids, and offtakes on a coke battery that are leaking. Charging emissions are determined by the total time that visible emissions occur during the charging of an oven with coal. A specific procedure has been developed to determine compliance with qualitative emission limits for each of the points where leaks occur.

MACT and LAER

The Clean Air Act Amendments of 1990 (CAAA) imposed the first Federal emission control requirements on coke oven emissions as hazardous air pollutants, as part of the National Emissions Standards for Hazardous Air Pollutants (NESHAP).[58] As a result of the CAAA, the EPA promulgated regulations for a new two-track set of national emission standards; the final regulations were published on October 27, 1993.[59]

Under the CAAA, the EPA was required first to promulgate technology-based standards and then to promulgate standards based on risk to human health. The EPA issued final emissions standards for hazardous air pollutants based upon a Maximum Achievable Control Technology (MACT) or a Lowest Achievable Emission Rate (LAER) for all coke batteries (table 2-13).[60]

Six emission points are subject to these standards: the charging operation, coke oven doors, topside lids and offtakes, collecting mains, and bypass/bleeder stacks. Both the MACT and LAER standards involve limits placed on charging time and the allowable percentage of leaking doors, lids, and offtakes at coke batteries. The LAER standards were issued for plants that sought more time to meet possibly even tougher standards based upon risks to human health that have yet to be issued.

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[53] U. S. International Trade Commission, *Metallurgical Coke: Baseline Analysis of the U.S. Industry and Imports*, (investigation No). 332-342, USITC publication 2745, March 1994, p 3-19.

[54] 42 USC §87401(d).

[55] Commission interviews with USEPA region officials, May 31, 2000.

[56] Commission interviews with U.S. foundry coke producers, May 2000.

[57] EPA, *Coke Oven Emissions from Wet-Coal Charged Byproduct Coke Oven Batteries—Background Information for Proposed Standards,* 1987, p. 3-19.

[58] Work practices for the control of employee exposure to coke emission limits are also subject to regulation by the U.S. Occupational Safety and Health Administration, 29 CFR 1910.1029. Unregulated releases exceeding 1 pound are also subject to release notification requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), 40 CFR 302.6.

[59] 58 FR 57898.

[60] Ibid.

Table 2-13
Emission limits for byproduct coke oven batteries

Emission point	MACT 12-31-95	MACT Beyond 2003 (must meet residual risk)	LAER 11-15-93	LAER 1-1-98	LAER 1-1-10
Doors (PLD[1])		lower of			
Tall[2]	6.0	5.5	7.0	4.3	4.0
Short[3]/Integrated[4]	5.5	5.0	7.0	3.8	3.3
Foundry[5]	5.5	5.0 or residual risk	7.0	4.3 or lower based on 2007 result	4.0
Lids (PLL[6])	0.6	lower of 0.6 or residual risk	0.83	0.4 or lower based on 2007 result	0.4
Offtakes (PLO[7])	3.0	lower of 0.6 or residual risk	4.2	0.4 or lower based on 2007 result	2.5
Charging - (log) seconds/charge[8]	12	lower of 0.6 or residual risk	12	0.4 or lower based on 2007 result	12

[1] "Percent leaking doors" as determined using EPA Reference Method 303. All standards are rolling averages of the last 30 daily readings - one per day.
[2] A "tall" battery is a battery with ovens 6 meters or more in height.
[3] A "short" battery is a battery with ovens less than 6 meters in height.
[4] An integrated steel producer is a company or corporation that produces coke, uses the coke in a blast furnace to make iron, and uses the iron to produce steel.
[5] A foundry coke producer is a coke producer that is not and was not on 01-01-93 owned or operated by an integrated steel producer and had on 01-01-92 an annual design capacity of less than 1.25 million megagrams per year
[6] "Percent leaking lids" as determined using EPA Reference Method 303. All standards are rolling averages of the last 30 daily readings - one per day.
[7] "Percent leaking offtakes" as determined using EPA Reference Method 303. All standards are rolling averages of the last 30 daily readings - one per day.
[8] Charging as determined using EPA Reference Method 303. Standards are calculated as a 30 day average of the log average of five charging observations per day.

Source: 58 FR 57899 and Ailor, "Principal Environmental Issues," 1999.

The firms in the foundry coke industry could elect either the MACT or LAER track for their batteries to remain in operation.[61] The operators of two domestic producers, Erie and Tonawanda, which have a total of three batteries (see table 2-1), chose the option of meeting the MACT technology-based standards by December 31, 1995.[62] Erie and Tonawanda must now meet emissions limits based upon a residual risk-based standard by January 1, 2003.[63] The four other domestic producers with a total of 11 batteries opted for the LAER track which entailed meeting interim standards by November 15, 1993, and the LAER technology-based standards by January 1, 1998. The second option enabled these companies to defer compliance with the residual risk-based standards for their batteries until 2020.[64]

[61] David C. Ailor, P.E. "Principal Environmental Issues Facing the Coke Industry In 1999 and Beyond," Paper presented to the International Tar Association, Colorado Springs, CO, May 4, 1999.

[62] Coke plants also had to meet work practice standards by November 15, 1993, regardless of the track selected.

[63] EPA is to issue the risk-based standards by October 27, 2001.

[64] The CAAA also requires the owner/operators of batteries on the LAER track to publicly disclose in 2000 the results of any residual risk assessment performed by the EPA.

In most cases, any new batteries that are constructed will have to meet stricter standards than do existing batteries.[65] New batteries that add capacity at an existing plant will have to meet the standard for nonrecovery ovens.[66] Construction of byproduct recovery ovens using a new technology will have to meet limits more stringent than the LAER limits.[67]

The foundry coke industry is approaching another deadline for new air pollution regulations. Under the CAAA, the EPA must promulgate an emissions standard for each of three sources of emissions (pushing operations, quenching operations, and combustion stacks) by November 15, 2000. Existing coke plants will have to comply with these new standards by 2003. Partly in response to these upcoming rulemakings, the ACCCI and the American Iron & Steel Institute (AISI) formed the AISI/ACCCI Coke Oven Environmental Task Force in 1996 to address the development of these regulations and other environmental issues.[68]

The CAAA authorized the U.S. Department of Energy and the administrator of the EPA to "assist in the development and commercialization of technically practicable and economically viable control technologies which have the potential to significantly reduce emissions of hazardous air pollutants from coke oven production facilities."[69] The act authorizes the Secretary of Energy and the EPA administrator to provide financial support for the development of such technologies, "provided that Federal funds shall not exceed 50 per centum of the cost of any project assisted . . . ."[70] According to industry officials, some projects have been approved and funds have been expended under this program.[71]

Water-Pollutant Emissions

The foundry coke industry must also comply with the provisions for permits and licenses of the Clean Water Act.[72] According to the EPA, a well-controlled byproduct coke plant generates about 100 gallons of process wastewater per metric ton of coke produced. Additional wastewater is sometimes generated from the quenching process and from runoff from the coal yard and plant site. Wastewater from the coking and byproduct recovery processes contains high levels of chemical oxygen demand, oil and grease, ammonia, cyanides, thiocyanates, phenolics, benzene, toluene, xylene, as well as other aromatic volatile components and polynuclear aromatic compounds.[73] The wastewater stream now generally undergoes a biological treatment process at the foundry coke plants to lower the incidence of various contaminants to acceptable levels before it is released into the receiving waters.

The EPA's effluent limitations guidelines and standards are industry-specific, technology-based standards that limit the amount of industrial wastewater pollutants being discharged into the receiving waters.[74] The specific emissions standards or permit requirements for each coke operation depend upon the nature of the receiving waters. One example of such permit requirements are those shown in table 2-14 for ABC Coke, located in Birmingham, AL. The conventional treatment approach consists of physical/chemical treatments, including oil separation, dissolved gas flotation, and ammonia distillation followed by biological treatment with nitrification.[75] The installation of biological treatment plants and recent improvements in the ammonia removal process at the various coke operations have added to the cost of producing coke but also have improved the quality of the effluent flows from these facilities.[76]

Following an assessment of the Iron and Steel Industry Category (which includes the coke industry) published in 1995, the EPA concluded that the industry had changed substantially since the regulations were originally promulgated.[77] In 1998, the EPA began reassessing the ELGs and standards affecting the coke industry. The EPA is scheduled to issue a proposed rule on these standards in October 2000 and a final rule in April 2002.[78]

Solid and Hazardous Waste

The solid and hazardous waste generated by the coke industry is also subject to regulation under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA). The major provisions of RCRA and TSCA that are of direct

[65] 58 FR 57900.
[66] 58 FR 57899.
[67] Ibid.
[68] Ailor, Principal Environmental Issues, 1999, p. 13.
[69] The 1990 Amendments to the Clean Air Act, Section 301.
[70] Ibid.
[71] Commission interview with industry officials, Jan. 18, 2000.
[72] Federal Water Pollution Control Act of 1972 as amended in 1977, 1978, 1981, and 1987.
[73] EPA, Preliminary Study of the Iron and Steel Category, EPA 821-R-95-037, Sept. 1995, p. 2-3.
[74] US EPA, "Effluent Guidelines, Iron and Steel Background," found at http://www.epa.gov/ost/ironsteel/background.html, retrieved May 19, 2000, p. 1.
[75] EPA, Preliminary Study of the Iron and Steel Category, EPA 821-R-95-037, Sept. 1995, p. 2-3.
[76] Commission interview with U.S. foundry coke producers, May 2000.
[77] EPA, Preliminary Study of the Iron and Steel Category, EPA 821-R-95-037, Sept. 1995, p. 2-9.
[78] Ailor, p. 18.

Table 2-14
Discharge limitations and monitoring requirements, ABC coke[1]

Effluent characteristic	Units	Discharge limitations: Daily minimum	Discharge limitations: Daily maximum	Discharge limitations: Monthly average[2]	Monitoring requirements[2]: Measurements frequency	Monitoring requirements[2]: Sample type
Treated process wastewater and storm water runoff from coke making operations:						
Flow	MGD	-	Monitor	Monitor	1/day	Totalized
pH	s.u.	6.0	8.5	-	1/day	Grab
Total suspended solids	ppd	-	1,148	595	2/week	Composite
Oil and grease	ppd	-	148	49	1/week	Grab
Ammonia nitrogen	ppd	-	256.3	75.2	1/week	Composite
Ammonia nitrogen	mg/1	-	97.2	Monitor	1/week	Composite
Cyanide	ppd	-	0.5	0.5	1/week	Grab
Benzene	ppd	-	0.15	-	1/month	Grab
Phenols (4AAP)	ppd	-	0.30	0.17	1/week	Grab
Naphthalene	ppd	-	0.15	-	1/month	Grab
Benzo(a)Pyrene	ppd	-	0.15	-	1 quarter	grab
Toxicity[3]	%survival	90	-	-	1/month	Grab
Storm water runoff from coal yard:						
Flow[3]	MGD	-	Monitor	Monitor	1/quarter	Staff gauge
pH	s.u.	6.0	8.5	-	1/quarter	Grab
Manganese, total	mg/1	-	4.0	2.0	1/quarter	Composite
Iron, total	mg/1	-	6.0	2.0	1/quarter	Composite
Total suspended solid	mg/1	-	70	35	1/quarter	Composite
Ammonia nitrogen	mg/1	-	Monitor	Monitor	1/quarter	Composite
Cyanide	μg/1	-	Monitor	Monitor	1/quarter	Grab
Benzene	μg/l	-	Monitor	Monitor	1/quarter	Grab
Phenols (4AAP)	μg/l	-	Monitor	Monitor	1/quarter	Grab
Benzo(a)Pyrene	μg/l	-	Monitor	Monitor	1/quarter	Grab
Naphthalene	μg/l	-	Monitor	Monitor	1/quarter	Grab

[1] Samples collected to comply with the monitoring requirements specified above shall be collected at the following location: at the nearest accessible location just prior to discharge and after final treatment. Unless otherwise specified, composite samples shall be time composite samples collected using automatic sampling equipment or a minimum of eight (8) equal volume grab samples collected over equal time intervals. All composite samples shall be collected for the total period of discharge not to exceed 24 hours.
[2] Monthly average limits apply only when a parameter is monitored more than once in a month.
[3] Discharge from this outfall shall occur only during or within 72 hours after a rain event of 1/8 inch or greater.

Source: ABC Coke Division, *Discharge Limitations and Monitoring Requirements*, Permit #AL0003417, pt. 1.

importance to the coke industry are the management of hazardous waste and the regulation of underground storage tanks. TSCA also authorizes EPA to require private parties to develop scientific data to assess the effects of chemical substances and mixtures on human health and the environment. In 1998, the administration started the HPV Challenge Program to increase the publicly available information on 2,800 high-production-volume commercial chemicals made and used in the United States. The program calls upon chemical manufacturers and importers to produce a set of data on health and environmental effects for most of these chemicals. The data are to be made available to the public by 2004. The HPV list includes about 30 coal-derived substances produced by the coke and coal chemicals industry.[79]

Pollution Abatement Costs

The annual expenditures to comply with U.S. pollution abatement requirements are significant for the economy in general and for the coke industry in particular. Current estimates for the total economy

[79] Ailor, 1999, p. 20.

exceed $140 billion.[80] Nearly 75 percent of this amount is spent on abatement of air and water pollution, in about equal proportions; the remainder is spent for other environmental purposes, including treatment of solid and hazardous waste. Pollution abatement expenditures for the production of foundry coke and the processing of coke byproducts were reported to be about $23.5 million in 1999, of which about $20.6 million was for operating costs (table 2-15) and about $2.9 million was for new capital expenditures (table 2-19). The expenditures reported in response to the Commission's questionnaire by the foundry coke industry for air-pollution abatement, water-pollution abatement, and handling of solid waste reflect the firm's total expenditures for pollution abatement.[81]

Operating Costs for Pollution Abatement

The foundry coke industry spent from $16.9 million to $20.6 million on operating costs for pollution abatement each year during 1995-99 (table 2-15). Air pollution abatement required the largest expenditures each year, taking more that 65 percent of total operating costs each year. Activities such as door maintenance and repair, along with luting of those doors that are not self sealing, in addition to the operation and maintenance of air pollution control equipment, such as hoods, and catalysts used in the desulfurization and denitrification of coke oven gas, were identified as the major air pollution abatement expenditures.[82]

Water pollution abatement expenditures rose steadily from about $4.3 million in 1995 to $6.0 million in 1999, consuming an increasing share, and more than 25 percent, of the operating costs each year. Major expenses in this category include the chemicals and biological media used in the treatment plants operated by the plants.

Expenditures for solid and hazardous waste are the smallest of the three media. Some firms in the industry dispose of solid waste by burning it in the coke ovens themselves, putting in a few bags at a time with the coal charge.[83] Operating costs for solid and contained hazardous waste accounted for less than 10 percent of pollution abatement operating costs each year of the period of investigation, and such costs were just over 3.5 percent in 1999.

The costs of pollution abatement in the foundry coke industry are more apparent when viewed in terms of cost per metric ton of production (table 2-16). The total operating costs for pollution abatement for the industry ranged from $13.49 to $17.35 per metric ton over the period. The operating costs for pollution abatement ranged from 10.4 percent to 12.6 percent of total production costs during 1995-99 (see table 2-5 for production costs). The average cost for pollution abatement rose more than 2 percent per year from 1995-99 as air pollution abatement costs rose by 2.5 percent per year, water pollution abatement costs rose more than 5 percent per year, and costs for handling solid/contained waste declined more than 8 percent per year.

The cost of air pollution abatement rose from about $9 per metric ton in 1995 to more than $12 per metric ton in 1998 as the firms improved their practices so as to meet the deadlines for attaining the NESHAP emission limits. Operating costs per metric ton for water pollution abatement rose nearly 40 percent over the period to about $4.50 per metric ton owing to an increased focus on water treatment. The costs per metric ton of production for handling solid/contained waste actually declined over the period.

Since capital equipment and depreciation expense for air and water pollution abatement represent significant parts of total operating costs, environmental costs may be more a function of capacity than of production (table 2-17). However, these numbers are fairly similar, albeit slightly lower, and follow the same trends since coke ovens are operated continuously, and production often parallels capacity.

In terms of percentage of value added to coal, the costs of pollution abatement are shown to be a significant portion of the total costs of the coking process (table 2-18). In these terms, the costs reportedly approached 35-40 percent of the value added for the industry, ranging from a low of 33.7 percent in 1995 to a high of 39.9 percent in 1998. By examining pollution control costs as a percent of value added instead of total costs, variations caused by differences in coal prices are removed from the analysis. The value-added figures may more closely represent the relative environmental operating costs for the industry.

New Capital Expenditures

Capital expenditures for pollution abatement reflect investments that the foundry coke producers

[80] Council on Environmental Quality, *Environmental Quality.* 29nd Annual Report of the Council on Environmental Quality, March 1999, p. 222.

[81] The Commission's questionnaire used for the current investigation requested similar data for environmental control costs and used the same definitions as the earlier Commission study of the broader metallurgical coke industry. See U.S.I.T.C., March 1994.

[82] Commission interviews with U.S. foundry coke producers, May 2000.

[83] Ibid.

Table 2-15
Operating costs for pollution abatement, 1995-99

(1,000 dollars)

Source	1995	1996	1997	1998	1999
Air:					
Depreciation/amortization	3,026	3,121	3,200	3,305	3,191
Salaries	4,597	4,795	5,269	5,648	5,636
Fuels and electricity	506	518	537	592	598
Contract work	288	332	491	769	758
Materials, leasing, and miscellaneous	2,799	3,293	3,783	4,775	3,630
Total	11,217	12,059	13,280	15,089	13,813
Adjusted total[1]	11,217	12,059	13,280	15,089	13,813
Water:					
Depreciation/amortization	609	717	923	1,676	1,671
Salaries	790	854	915	746	768
Fuels and electricity	496	541	546	563	594
Contract work	143	131	142	136	159
Materials, leasing, and miscellaneous	1,932	1,781	2,030	2,458	2,399
Total	3,969	4,023	4,555	5,579	5,591
Adjusted total[1]	4,304	4,379	4,976	5,993	6,024
Solid/contained waste:					
Depreciation/amortization	5	5	5	5	5
Salaries	148	152	161	165	172
Fuels and electricity	1	1	1	1	1
Contract work	31	46	70	25	36
Materials, leasing, and miscellaneous	1,222	659	1,202	597	511
Total	1,407	862	1,439	793	725
Adjusted total[1]	1,407	862	1,439	793	725
Adjusted grand total[1]	16,928	17,300	19,695	21,875	20,562

[1] These operating costs are total operating costs, plus payments to governments for services, minus pollution abatement costs offset.

Note.—Because of rounding, figures may no add to the totals shown.

Source: Data compiled from responses to Commission questionnaires.

Table 2-16
Operating costs for pollution abatement per metric ton of production, 1995-99

Source	1995	1996	1997	1998	1999
Air:					
Depreciation/amortization	$2.46	$2.66	$2.61	$2.67	$2.56
Salaries	3.74	4.09	4.30	4.57	4.51
Fuels and electricity	.41	.44	.44	.48	.48
Contract work	.23	.28	.40	.62	.61
Materials, leasing, and miscellaneous	2.28	2.81	3.09	3.86	2.91
Adjusted total[1]	9.12	10.29	10.84	12.20	11.07
Water:					
Depreciation/amortization	$0.50	$0.61	$0.75	$1.35	$1.34
Salaries	.64	.73	.75	.60	.62
Fuels and electricity	.40	.46	.45	.46	.48
Contract work	.12	.11	.12	.11	.13
Materials, leasing, and miscellaneous	1.57	1.52	1.66	1.99	1.92
Adjusted total[1]	3.23	3.43	3.72	4.51	4.48
Solid/contained waste:					
Depreciation/amortization	$0.00	$0.00	$0.00	$0.00	$0.00
Salaries	.12	.13	.13	.13	.14
Fuels and electricity	.00	.00	.00	.00	.00
Contract work	.03	.04	.06	.02	.03
Materials, leasing, and miscellaneous	.99	.56	.98	.48	.41
Adjusted total[1]	1.14	.74	1.17	.64	.58
Grand total	13.49	14.46	15.73	17.35	16.13

[1] These operating costs are total operating costs, plus payments to governments for services, minus pollution abatement costs offset.

Note.—Because of rounding, figures may not add to the totals shown.

Source: Data compiled from responses to Commission questionnaires.

Table 2-17
Operating costs for pollution abatement per metric ton of capacity, 1995-99

Source	1995	1996	1997	1998	1999
Air:					
Depreciation/amortization	$1.81	$1.87	$1.92	$1.98	$1.91
Salaries	2.76	2.87	3.16	3.39	3.38
Fuels and electricity	.30	.31	.32	.35	.36
Contract work	.17	.20	.29	.46	.45
Materials, leasing, and miscellaneous	1.68	1.97	2.27	2.86	2.18
Adjusted total[1]	6.73	7.23	7.96	9.05	8.28
Water:					
Depreciation/amortization	$0.37	$0.43	$0.55	$1.00	$1.00
Salaries	.47	.51	.55	.45	.46
Fuels and electricity	.30	.32	.33	.34	.36
Contract work	.09	.08	.09	.08	.10
Materials, leasing, and miscellaneous	1.16	1.07	1.22	1.47	1.44
Adjusted total[1]	2.38	2.41	2.73	3.35	3.35
Solid/contained waste:					
Depreciation/amortization	$0.00	$0.00	$0.00	$0.00	$0.00
Salaries	.09	.09	.10	.10	.10
Fuels and electricity	.00	.00	.00	.00	.00
Contract work	.02	.03	.04	.01	.02
Materials, leasing, and miscellaneous	.73	.40	.72	.36	.31
Adjusted total[1]	.84	.52	.86	.48	.43
Adjusted grand total	9.95	10.16	11.56	12.85	12.07

[1] These operating costs are total operating costs, plus payments to governments for services, minus pollution abatement costs offset.

Note.—Because of rounding, figures may not add to the totals shown.

Source: Data compiled from responses to Commission questionnaires.

Table 2-18
Operating costs for pollution abatement, as percent of value-added, 1995-99

Source	1995	1996	1997	1998	1999
Adjusted totals:[1]					
Air	22.4	24.0	25.8	27.5	23.2
Water	8.6	8.7	9.7	10.9	10.1
Solid waste	2.8	1.7	2.8	1.4	1.2
Adjusted grand total [1]	33.7	34.5	38.3	39.9	34.6

[1] These operating costs are total operating costs, plus payments to governments for services, minus pollution abatement costs offset from table 2-16. The value-added per metric ton of production are from table 2-5. For example, in 1999, operating costs were $16.13 and the value-added was $137.86 minus $90.22 or $47.64. Thus, the operating costs were 34.6 percent of the value-added.

Note.—Totals may not add due to rounding.

Source: Data compiled from responses to Commission questionnaires.

Table 2-19
New capital expenditures for pollution abatement, by media, 1995-99

Source	1995	1996	1997	1998	1999
			1,000 dollars		
Air:					
End-of-line	182	654	438	1,013	154
Production process	2,685	3,629	1,964	1,362	770
Total	2,867	4,283	2,402	2,375	924
Water:					
End-of-line	26	0	516	3,813	60
Production process	510	242	2,600	2,326	1,462
Total	536	242	3,203	6,255	1,606
Sold/contained waste:					
End-of-line	114	0	0	99	221
Production process	0	232	0	1,502	157
Total	114	232	0	1,601	377
Grand total	3,517	4,757	5,605	10,231	2,907

Source: Data compiled from responses to Commission questionnaires.

undertake when they install new equipment to meet air and water emissions limits and other environmental requirements. In the foundry coke industry, investments in end-of-line equipment for air pollution abatement, such as hoods and modifications to desulfurization equipment, are substantially less than investments in production-process changes such as new doors, new door- and jamb-cleaning equipment, modifications to pushing equipment and spotting devices, and repairs and replacements of standpipes (table 2-19). As would be expected, the new capital expenditures for air pollution abatement were the most substantial in the early years of the period and have declined substantially since 1996.[84]

End-of-line equipment investments for water include newly installed or modified water treatment facilities, and production-process changes include modifications to ammonia and sulfur removal processes, and the addition of liquid waste storage capacity in the byproduct plant. Such expenditures have increased significantly since 1995, and actually exceeded the investments for air pollution abatement during 1997-99 as firms invested in new water treatment facilities. New capital expenditures for solid/contained waste represent the smallest investments of the three media.

The pattern of investments in new equipment appears to reflect the timing of the changes in environmental requirements. In 1995 and 1996, about 90 percent of all new capital expenditures went to improve the industry's performance on air pollution abatement, as the firms prepared to meet the NESHAP limits in 1998. However, from 1997 through 1999, the majority (about 70 percent) of the new capital investments were for water pollution abatement, and these investments appear to have gone primarily into the byproduct processing areas of the coke plants. According to some industry officials, the byproduct processing plants have become the focus of environmental improvements as the environmental performance of the coke ovens themselves has improved as the companies have met the provisions of the CAAA.[85] The capital costs for pollution abatement are substantial, ranging from $1.69 to $6.07 per metric ton of capacity during the period (table 2-20).

[84] Commission interview with U.S. foundry coke producers, March and May 2000.

[85] Commission interview with U.S. foundry coke producers, May 2000.

Table 2-20
New capital expenditures for pollution abatement, per ton of capacity, 1995-99

Source	1995	1996	1997	1998	1999
Air:					
End-of-line	$0.11	$0.39	$0.26	$0.61	$0.09
Production process	1.61	2.18	1.18	.82	.46
Total	1.72	2.57	1.44	1.43	.55
Water:					
End-of-line	.02	.00	.31	2.29	.04
Production process	.31	.15	1.56	1.39	.88
Total	.33	.15	1.87	3.68	.92
Solid/contained waste:					
End-of-line	.07	.00	.00	.06	.13
Production process	.00	.14	.00	.90	.09
Total	.07	.14	.00	.96	.22
Grand total	2.12	2.86	3.31	6.07	1.69

Source: Data compiled from responses to Commission questionnaires.

CHAPTER 3
CHINESE FOUNDRY COKE INDUSTRY PROFILE AND MARKET

The emergence of Chinese coke production as a major industry is a relatively recent phenomenon. Blast furnace coke[1] production grew rapidly after 1980[2] as the Chinese steel industry expanded to match growth across the industrial sector.[3] Production capacity for all types of coke is currently estimated at 171 million metric tons, approximately double the capacity in 1992.[4] Foundry coke capacity increased substantially as well, increasing to an estimated 2.9 million metric tons in 1997.[5] As a result of this recent growth, China is now the world's largest exporter of foundry coke,[6] as well as of other cokes.[7] Chinese foundry coke production is geographically concentrated, with Shanxi Province the only region reported to produce foundry coke.[8]

Chinese coke of all types was originally produced to meet the standards of the domestic market. Later, when Chinese firms attempted to enter foreign markets, the quality of Chinese coke did not always meet the standards of foreign buyers.[9] Over time, as exports increased, foreign customers sought improvements in product quality, and the Chinese industry worked to improve product performance (notably in terms of ash content, a factor affecting foundry coke performance), reliability of supply, transportation, and warehousing.[10]

An important issue confronting the Chinese foundry coke industry today is the introduction of environmental controls. Chinese producers have worked to lessen the pollution caused by foundry coke production, both to address domestic environmental concerns and for export marketing reasons.[11] New environmental regulations affecting coke have been issued at both the national and provincial levels in China, with the goal of closing all older technology facilities in China. As a result, Chinese foundry coke capacity has reportedly decreased with the closure of these ovens, though the final number of closures has yet to be determined, and will depend on compliance with the announced regulations.

Another important issue in the industry is the impact of the Asian financial crisis, which began in the summer of 1997. While the full effects of the Asian economic downturn are not yet known, reduced economic activity in several export markets roughly coincided with increased Chinese foundry coke exports to the United States.[12]

Chinese Industry Profile[13]

There are three types of coke plants in China: blast furnace coke plants, foundry coke plants, and other coke plants.[14] Chinese producers have repeatedly ex-

[1] In China, blast furnace coke is also referred to as metallurgical coke, which does not include foundry coke.

[2] Biswambhar Goswami, *Chinese Coke 1999 Directory,* p. B.

[3] William T. Hogan, "The Changing Shape of the Chinese Steel Industry," *New Steel*, Oct. 1999, pp. 28-37.

[4] International Iron and Steel Institute, *Coke and Its Alternatives*, 1997, p. 28.

[5] Commission fieldwork, Shanxi Province, China, March 2000.

[6] B. Goswami, *Chinese Coke 1999 Directory*, p. 76.

[7] Raoul Oreskovic, "The Emergence of China As A Major Coke Supply Source," found at *http://www.chinaenergyresources.com/article.html*, retrieved Aug. 13, 1999.

[8] Commission interviews with U.S. foundry coke producers, Nov. 19, 1999, and Nov. 23, 1999.

[9] B. Goswami, *Chinese Coke 1999 Directory*, p. B.

[10] B. Goswami, *Chinese Coke 1999 Directory*, pp. B and C. Commission interviews with industry sources, Nov. 19, 1999, Nov. 23, 1999, and January 19, 2000.

[11] Commission interviews of U.S. industry representatives, Nov. 19, 1999, and Nov. 23, 1999.

[12] Neil J. Bristow, "The Asian Crisis: Its Impact on Coke and Steel Markets," paper presented to Coke Outlook 1999, New Orleans, LA, Feb. 3-5, 1999. Commission interviews with U.S. industry sources, Nov. 19, 2000. Data also were obtained from Commission fieldwork in Beijing, Taiyuan, Tianjin, Wuhai, and other locations in China, March 2000.

[13] Data available on Chinese foundry coke were limited. Commission fieldwork in China, interviews in the United States, and third party sources were used in addition to limited data provided by the Chinese Government. Sources in this chapter are not always in agreement, and, where possible, data are presented from multiple sources for comparative purposes.

[14] Chinese producers refer to foundry coke separately from metallurgical coke. In the United States, foundry coke is a subset of metallurgical coke.

plained that switching production from one type of coke to another is not difficult in China. For example, shifting from the production of blast furnace coke to foundry coke would only require adjustments of the coal mix used and the coking time. Market conditions generally dictate the choice of production type and product mix can change as market conditions dictate.[15]

Chinese Capacity and Production

In 1997, there were 25 companies in Shanxi Province producing foundry coke (table 3-1). These companies vary greatly in size and several are integrated vertically and/or horizontally. Ten of these companies are also known to produce other types of coke and coal products, and eight have their own mines to supply at least part of their raw material.[16] Production capacities of the 25 individual foundry coke producers range from 16,000 to 400,000 metric tons per year. Annual foundry coke production capacity for selected firms in Shanxi Province as well as the number of ovens is presented in table 3-2. Of the 2.9 million metric tons of 1997 Chinese foundry coke production capacity, an estimated 1.46 million metric tons, or 53.1 percent, was built in the 1990s.

During 1992-96, Chinese production capacity for all types of coke increased to approximately 147 million metric tons. It is currently estimated at 171 million metric tons.[17] By 1996, the improved beehive type of cokemaking was estimated to account for 48 percent of total Chinese capacity. In 1996, all coke capacity was expected to grow following a predicted expansion of blast furnace pig iron production.[18] However, since that time, new Chinese environmental regulations have been announced, providing a downward pressure on total coke capacity. Table 3-3 shows production capacity of all types of coke in China.

Official Chinese production data for foundry coke are not available.[19] However, an industry analyst[20] estimated that total Chinese foundry coke production in 1997 was approximately 2.6 to 2.7 million metric tons.[21] Market conditions recently have been more favorable for the production and export of blast furnace coke and coke other than foundry coke. As a result, the capacity utilization rate for foundry coke is likely not as high as that for other types of coke, indicating this estimate may be overstated.[22]

Total Chinese production of all types of coke increased rapidly after the economic reforms starting in 1978. In 1985, total coke production in China was 48.4 million metric tons. By 1997, this output had increased to 137.3 million metric tons, but declined to

[15] Commission fieldwork in Beijing, Tianjin, Taiyuan, and Wuhai, March 2000.

[16] B. Goswami, *Chinese Coke 1999 Directory*, p. 76.

[17] International Iron and Steel Institute, *Coke and Its Alternatives*, 1997, p. 28.

[18] Ibid., p. 28.

[19] This is confirmed by Commission interviews with Chinese Government officials during Commission interviews conducted in Beijing, Tianjin, Taiyuan, and Inner Mongolia.

[20] B. Goswami, *Chinese Coke 1999 Directory*.

[21] This figure is calculated by the multiplication of 2.89 million metric tons of production capacity by the capacity utilization rate of 92.1 percent for all Chinese coke production.

[22] Commission fieldwork in Beijing, Tianjin, Shanxi Province, and Inner Mongolia. Chinese coke producers report that the price difference between foundry coke and blast furnace coke is much smaller than in years previous. Because of the longer coking times, smaller volumes, and other aspects of foundry coke production, there is an incentive for producers to produce blast furnace coke, not foundry coke.

Table 3-1
Chinese coke: Number of plants, production capacity, and exports, 1997, by plant type, in Shanxi Province

Type	Number of plants	Production capacity	Exports
		1,000 metric tons	
Blast furnace coke	50	10,205	6,520
Foundry coke	25	2,890	1,214
Other cokes	16	5,625	1,180

Note.—The capacity data on China takes into account producers that produce more than one type of coke. The data does not, however, account for the technical substitution of production. Commission fieldwork in China, March 2000.

Source: B. Goswami, *Chinese Coke 1999 Directory*.

Table 3-2
Selected Chinese foundry coke producers in descending order of production capacity, with number of ovens, number of employees, and year established, 1997

Company name	Annual production capacity	Number of ovens	Year established	Number of employees, 1997
	(1,000 netric tons)			
Ying Xian	400	168	1987	850
Top Reach (De-Rui)	[1]350	[1]150	1994	[2]1,526
Ju Fu	300	100	1994	500
Xiao Shan	[1]300	[1]84	1985	[2]1,500
Sanjia	[1]150	[1]24	1983	[2]2,000
Yuan Hui	150	80	1989	([3])
Feng Yang Wen Feng	130	132	1993	300
Ping Yao Feng Yang	[1]120	[1]40	1996	[2]300
Shuang Fa	100	56	1997	([3])
Zhong Pu	100	48	1987	300
Bai Zhang	80	48	1988	200
Jin Yang	[1]60	[1]53	1994	150
Military farmland	60	44	1989	100
Huang He	50	24	1994	150
Jia Wei	50	60	1994	80
Liangyu	50	80	1994	150
Ping Yao Hua Feng	[1]50	[1]14	1994	[2]300
San Sheng	[1]50	[1]50	1986	[2]1,300
Tang Xin	50	[1]15	1993	[2]110
Ying Xing	50	32	1993	([3])
Wen Fei	[1]40	[1]60	1993	200
Ying Dong	40	40	1993	90
Fu You	30	20	1995	65
Bao Wan	20	22	1997	([3])
Yao Long	16	16	1992	[2]230
Estimated Other	94	—	—	—
Totals	2,890	1,460	–	([3])

[1] Includes estimates from data for multiple products.
[2] Includes workers involved in the production of other products.
[3] Not available.
Source: B. Goswami, *Chinese Coke 1999 Directory*.

Table 3-3
Chinese nationwide cokemaking capacity and coke production (all types of coke), 1992, 1996 and 2000

Item	1992	1996	2000
Total:			
Cokemaking capacity *(millions of metric tons)*	86.68	146.56	[1]171.0
Coke production *(millions of metric tons)*	79.85	135.01	([2])
Capacity utilization *(percent)*	92.1	92.1	([2])

[1] Estimated.
[2] Not available.

Source: International Iron and Steel Institute, *Coke and Its Alternatives, 1997.*

122 million metric tons in 1998, and 110 million tons in 1999.[23]

Virtually all foundry coke in China is produced in beehive or modified beehive ovens. With the growing importance of quality in the foundry coke market and the emergence of new environmental regulations, Chinese coke producers reported that the industry could move towards slot oven production of foundry coke in coming years. A slot oven battery in China would take 12 to 16 months to build.[24] Officials at several Chinese coke plants provided examples of the costs of building slot ovens in China (table 3-4). Presently, those ovens will be used for the production of blast furnace coke, but could be used for foundry coke production in the future.

Many large scale coke producers are iron, steel, or gas companies. According to industry sources, Chinese foundry coke producers are principally private firms.[25]

China produces coke in mechanical (e.g., slot ovens) and non-mechanical coke plants. The mechanical coke plants, which utilize by-product recovery ovens and technology similar to that used in the United States and described in Chapter 1, are used largely to produce blast furnace coke. These plants are large-scale production facilities, requiring a much greater initial capital investment.[26] There are several types of non-mechanical coke plants in use in China, including primitive ovens, beehive ovens, and various forms of modified beehive ovens. Primitive ovens and early beehive ovens in China were similar to the dome-shaped beehive ovens either built into earthen banks or against other ovens that were once dominant in the United States.[27] In China, the rapid development of coke production in the 1980s and 1990s was aided by the low fixed costs of such early ovens. Shanxi Province, where most foundry coke is produced, also enjoys a very large brick production industry, aiding the low cost construction of the coke ovens.[28]

Compared with slot oven coke, beehive coke is reportedly inferior in terms of the quality of the final product. The coal itself provides the energy for the coking process. The production of beehive coke consumes up to 30 percent more coal and emits more pollutants per unit of output. An even older technology is used in open pit ovens, where essentially a hole is dug in the ground and filled with coal for firing and coking.[29]

During 1980-97, beehive production of all types of coke increased 599.0 percent, almost 6 times as fast as the growth in mechanical production.[30] In 1985, beehive foundry coke accounted for 16.7 percent of China's total coke production; by 1997, this number had increased to 41.0 percent (figure 3-1). One

[23] Robert Weinhieffer of Krupp Wilputte, *Restructuring the Coke Industry into the Year 2000*; and B. Goswami, *Chinese Coke 1999 Directory*, p. I. The figure for 1999 is an estimate by the Director of Commerce of Importers and Exporters of Metals, Minerals and Chemicals, China.

[24] Commission fieldwork, Tianjin, China, March 2000.

[25] The definition of "private" appears unclear when referring to ownership in the Chinese foundry coke industry. The relationship between the foundry coke firms and government agencies, such as the Economic and Trade Commission of Shanxi Province, was not fully explained. Commission fieldwork in Beijing and Shanxi Province, China, March 2000.

[26] Commission fieldwork at both slot oven and beehive oven coke plants in the United States and China, Nov. 1999-March 2000.

[27] Nils Anderson, Jr. *North American Coke Today*, 1990, p. 1.

[28] Commission fieldwork in Shanxi and Inner Mongolia, March 2000.

[29] Ibid.

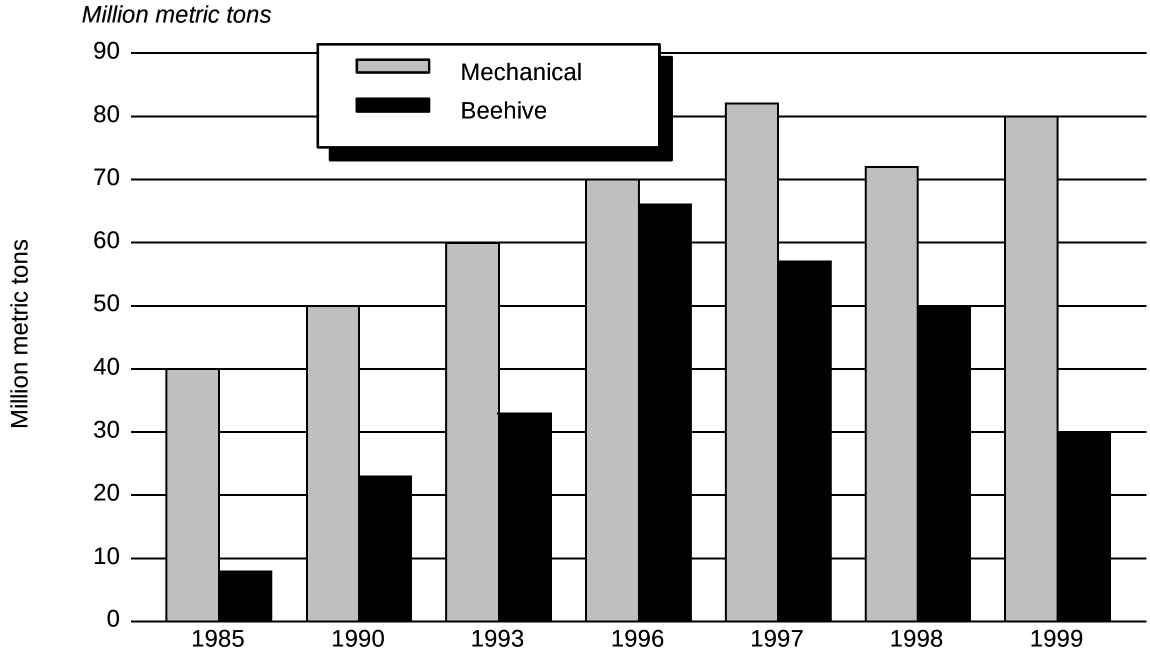
[30] Mechanical production of coke increased by 111 percent.

Table 3-4
Sample capital costs of building slot ovens in China

Reported by	Description	Cost
Inner Mongolia Trading	225,000 million metric tons, 4 batteries, 160 ovens	50 million RMB ($6.0 million) (not including coal washing facilities).
General Nice	400,000 million metric tons	150 million RMB ($18.1 million) for ovens alone; 350 million RMB ($42.2 million) for battery, coal washing, and recovery equipment.
Huanghe Coke factory	90 total ovens (3 batteries)	35 million RMB ($4.2 million).

Source: Commission fieldwork in China, March 2000.

Figure 3-1
Chinese coke production method (for all types of coke), 1985, 1990, 1993, 1996-99



Source: Robert Weinhieffer of Krupp Wilputte, *Restructing the Coke Industry into the Year 2000.*

estimate claims that in 1997, about 80 percent of the 65.5 metric tons of beehive oven coke production was at risk for closure because of failure to comply with environmental standards.[31] In 1999, beehive ovens accounted for 27.3 percent of coke production.[32]

The total reported number of ovens in operation at Shanxi foundry coke plants was 1,460 in 1997.[33] The total annual production capacity of these plants for that year was 2.9 million metric tons of foundry coke. Though the average age of the remaining ovens at Chinese plants is not available,[34] the year of establishment for these plants ranged between 1983 and 1997, and the number of employees varied between 65 and 2,000 workers.[35]

[31]Tian-Rui Li, "Trend in Coking Industry in Shanxi, China," paper presented at Coke Outlook 1999, New Orleans, LA, Feb. 3-5, 1999.

[32] Commission fieldwork in China, March 2000.

[33] B. Goswami, *Chinese Coke 1999 Directory,* p. 76.

[34] International Iron and Steel Institute, *Coke and Its Alternatives*, 1997, p. 26.

[35] The number of workers listed for the plants includes workers who might be engaged in the production of products other than foundry coke.

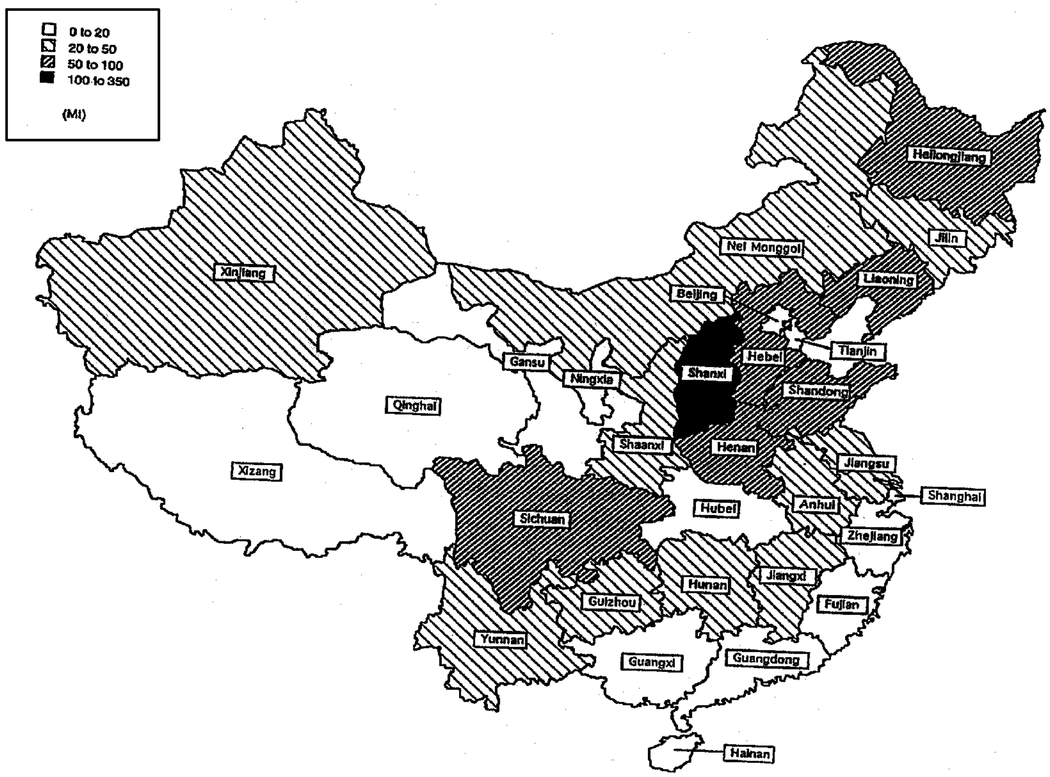
Coal Production in China

The production of all Chinese coke is dependent on coal production. Ranked fourth in the world, Chinese reserves of recoverable coal total 127 billion metric tons. This includes 69 billion tons of anthracite and bituminous coal, of which 29 percent is coking quality bituminous coal.

Exports of foundry coke come from Shanxi Province, where much of China's coal reserves are located. Shanxi currently accounts for over 25 percent of total coal production in China and supplies coal to almost all of China's 30 provinces.[36] The next largest coal producer is Henan Province, which accounts for less than 10 percent of total Chinese coal output. Almost all of the large, state-owned mines are located in the north and northeast. Southern coals are generally higher in sulfur and ash, making them less suitable for foundry coke production. Figure 3-2 shows the location and magnitudes of provincial coal production in China.

[36] For more information on interprovincial coal transport, see the *Chinese Energy Data Book*, 1996, pp. II-2 and tables II-6, II-8, and II-29.

Figure 3-2
Chinese coal production by province, 1996



Source: Chinese Energy Databook, 1996.

Foundry Coke Co-products and Byproducts

Foundry coke production in China is done almost exclusively in non-recovery beehive ovens, thus no by-products are recovered. Co-products such as coke that is not suitable for industrial sale because of small size and semi-coke are sold in the domestic market and used as fuel for heating or cooking in Chinese homes.[37]

Chinese Consumption

In China, the major consumers of all types of coke are the metallurgical industry, private households, the chemical industry, and the construction industry. Chinese consumption of all types of coke was approximately 126 million metric tons in 1995, an increase from 61.0 million metric tons in 1988 and 81.25 million metric tons in 1992. Based on export statistics and estimated Chinese production in 1997, Chinese consumption of foundry coke in 1997 was estimated at approximately 1.3 to 1.4 million metric tons. Officials at Chinese foundry coke plants report that the higher quality coke is designated for export while coke of lesser quality is consumed domestically.[38]

Chinese domestic consumption of foundry coke is driven by the casting industry. According to the Chinese Foundry Association, there were approximately 10,500 foundries in China in 1998, excluding small foundries operated by individual townships. Table 3-5 shows the distribution of foundries among administrative districts in China. The largest share of foundries is located in the industrialized eastern part of China (34.1 percent), followed by the Mid South District (22.3 percent). The Northeast District includes the old industrial base in Liaoning Province, but the Southwest and Northwest Districts have fairly low shares (8.1 and 5.9 percent respectively).[39]

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[37] Commission fieldwork in China, March 2000.

[38] Commission fieldwork, Shanxi Province, China, March 2000.

[39] "The Chinese Foundry Industry: An Overview," The China Foundry Association, found at website *http://www.foundry-China.com*, retrieved Jan. 14, 2000.

Table 3-5
The number and distribution of foundries in China, 1998

Rank	District	Provinces/regions	Number of foundries	Percent
1	North China	Beijing, Tianjin, Hebei, Shanxi, Nei Mongol	1,390	13.2
2	Northeast	Heilongjiang, Liaoning	1,720	16.4
3	East China	Shanghai, Jiangsu, Zhejiang, Shandong	3,580	34.1
4	Mid-South	Hennan, Hubei, Hunan, Guandong	2,340	22.3
5	Southwest	Sichuan, Yunnan, Guizhou, xizang	850	8.1
6	Northwest	Shanxi, Gansu, Ningxia, Xingjiang Qinghi	620	5.9
Total	6 Districts	30 Provinces	10,500	100

Source: The China Foundry Association.

The China Foundry Association predicted that casting output will increase annually by an average of 4-5 percent, while total output is expected to reach 13.5 million tons by the year 2000. Tables 3-6 and 3-7 show demand by casting classification and by industry. According to the China Foundry Association, demand for casting pieces will continue to rise through 2005, but not at the rate experienced in previous years because of increasing use of plastics and fabricated components for cast products.

The growth of various industries in China has had a significant effect on demand for castings. Demand for castings is greatest in the metallurgical, mining, and heavy machinery industries; the architectural industry (including cast iron pipe); the agricultural machine; and the automotive industries. The machine tool, general machinery, and power equipment industries also create significant demand for castings.

Trade

Imports

According to industry sources, China does not import foundry coke. While China has increased its imports of coking coals from Australia, most Chinese coke and coal representatives reported that the quantities of coal imports from Australia and other countries are still negligible.[40]

Exports

Industry sources indicate the three largest export markets for Chinese foundry coke in 1999 were Japan (approximately 750,000 to 800,000 metric tons), the European Union (approximately 350,000 metric tons), and the United States (approximately 100,000 metric tons).[41] Other reported markets included India, the Republic of Korea, Brazil, Thailand, Malaysia, and Taiwan.[42] In 1997, Shanxi Province exported about 1.2 million metric tons of foundry coke.

Total Chinese exports of all coke in 1999 amounted to 10 million metric tons. During 1996-99, the volume of Chinese exports of all types of coke to the United States has remained relatively steady at approximately 1.1 to 1.3 million metric tons (table 3-8). Because of the decline in prices, however, the value of these exports decreased, from a high of $95 million in 1997 to $43 million in 1999.

The Chinese foundry coke and blast furnace coke industries are facing trade actions in various countries and regions. In September 1998, the Indian Government imposed a minimum anti-dumping duty of rupees (RS) 692 per metric ton on a floor price of RS 4,673 per metric ton on imports of Chinese coke. In January 2000, India ordered imposition of dollar-denominated anti-dumping duties of $18 to $25 per metric ton on imports of Chinese coke. Duties are to be company-specific in dollar terms, but payable in rupees.[43]

In response, the Chinese Government decided to impose a check on all exports of Chinese coke to India. The Ministry of Foreign Trade in Beijing has issued a circular that exporters will be required to obtain licences to export all types of coke to India. Some Indian

[40] Commission fieldwork in Beijing, Tianjin, Taiyuan, and Inner Mongolia, March 2000.

[41] Commission fieldwork, interviews with U.S. industry sources, Jan. 28, 2000.

[42] Commission interviews with U.S. industry sources, Nov. 23, 1999; and B. Goswami, *Chinese Coke 1999 Directory*, p. 76.

[43] U.S. Embassy in Beijing, China. Fax sent to Commission, dated May 9, 2000.

Table 3-6
Forecasted casting demand in 2000, by casting classification

Casting classification and materials	Output	Percent of total
	1,000 tons	
Iron castings:		
Gray	8,683.20	64.32
Ductile	2,085.75	15.45
Malleable	329.40	2.44
Total	11,098.35	82.21
Steel castings:		
Carbon	864.70	6.41
Alloy	370.55	2.74
Total	1,235.25	9.15
Non-ferrous alloy castings:		
Al-alloy	977.40	7.24
Cu-alloy	114.75	.85
Others	74.25	.55
Total	1,166.40	8.64
Total	13,500.00	100.00

Source: The China Foundry Association.

Table 3-7
Forecasted casting demand in 2000, according to industry

Item	Output	Percent
Automotive	2,106.0	15.6
Locomotive	1,012.5	7.5
Agricultural machines and internal combustion engines	2,254.5	16.7
Machine tools	945.0	7.0
Valves, petroleum and chemical machinery	553.5	4.1
Metallurgical, mining, heavy machinery	1,336.5	9.9
Electrical machinery and power equipment	418.5	3.1
Ingot molds	648.0	4.8
Cast pipes	2,497.5	18.5
Pipe fittings	405.0	3.0
Leisure goods	202.5	1.5
Others	1,120.5	8.3
Total	13,500.0	100.0

Source: The China Foundry Association.

Table 3-8
China's exports of coke of all types, by market, 1996-99

Year	1996	1997	1998	1999
	(Million metric tons)			
United States	1.1	1.3	1.2	1.1
India	1.1	1.9	1.4	1.2
Brazil	0.5	0.9	1.3	0.5
Other	5.0	6.7	7.6	7.2
Total	7.7	10.8	11.5	10.0
	(Millions of U.S. dollars)			
United States	86	95	87	66
India	81	136	95	66
Brazil	34	63	82	25
Other	410	514	534	394
Total	611	808	798	551

Source: U.S. Department of State, *Telegram*, Ref. No. 218950, Jan. 4, 2000. Data for 1999 was obtained from the U.S. Embassy in Beijing, fax dated June 16, 2000.

industry sources believe this move will cause a significant decrease in coke exported to India in the next 3 to 6 months.[44] Chinese foundry coke producers in Shanxi Province report that the Indian duties on all coke will not have a significant effect on the Chinese industry, noting that India's demand for coke cannot be met by domestic producers, and that despite the higher tariffs, Chinese coke will remain the cheaper alternative for Indian buyers.[45]

European foundry coke producers submitted an anti-dumping complaint to the European Commission in August 1999.[46] On June 14, 2000, the European Commission imposed a provisional anti-dumping duty on imports of Chinese coke in pieces larger than 80 mm. The amount of the duty imposed is equal to EUR 33.7 per ton of dry net weight, or $32 per metric ton.[47]

Third-country trade actions are significant because of possible trade diversions affecting the United States. Possible effects on the U.S. market of Indian trade actions are limited by the relatively small amount of foundry coke India imports from China. The European Union, however, imported approximately 3.5 times more Chinese foundry coke than the United States in 1999. The result of the EU trade action against Chinese foundry coke could possibly have a larger effect on the U.S. market.

Production Costs

Production costs for foundry coke in China were collected by the Commission staff from several Chinese coke producers during fieldwork in China. As a result, Chinese coke production costs were reported in varying degrees of detail. All reported that coal prices are the biggest determinant of costs, followed by transportation. A number of other input costs, taxes, and fees also add to the cost of production. These costs are outlined in table 3-9.[48] The total costs shown in the table do not include profit for the plant.

A 17-percent value-added tax (VAT) is applied to coke production, and an export rebate is applied if the product is sold abroad.[49] Social welfare costs include payments for health care fees, education, and government fees. Officials at one Chinese foundry coke plant

[44] Ibid.

[45] Commission fieldwork, interviews with Chinese coke producers, Beijing and Taiyuan, China, March 2000.

[46] EUCOKE-EEIG and COKES de Drocourt. *Antidumping Complaint: Concerning Imports of Coke over 80 MM Originating in the People's Republic of China*," Non-Confidential Version, 1999.

[47] European Commission, *Official Journal of the European Communities*, "Commission Decision No. 1238/2000/ECSC of June 14, 2000, imposing a provisional anti-dumping duty on imports of coke of coal in pieces with a diameter of more than 80 mm originating from the People's Republic of China," June 14, 2000.

[48] Commission interviews with Chinese coke producers in China, March 2000.

[49] Commission interviews with Chinese coke producers in China, March 2000. According to Chinese producers, a VAT tax is already factored into the price of coal they list. Application of the VAT on other parts of production is not clear.

Table 3-9
Costs of production of foundry coke in China

(Per metric ton of coke)

Source	RMB	U.S. dollars[1]
Cost of production:		
Coal	180.0 - 275.0	$21.69 - $33.13
Labor	22.0 - 88.0	2.65 - 10.65
Social welfare	3.0	.36
Water resource fee	4.0	.48
Environmental fee	10.0	1.20
Service charge	6.0	.72
Equipment depreciation	22.5	2.71
Bank interest	12.0	1.45
Energy fund (tax on coal, energy)	20.0	2.41
Management fee (half to Shanxi Coke Center)	18.0	2.17
Total	297.5 - 458.5	35.84 - 55.28

[1] Based on official exchange rate of 8.3 RMB/U.S. dollar.

Source: Commission fieldwork, Shanxi Province, China, March 2000.

stated that production costs would be expected to rise 20 to 30 percent if it were to build slot ovens.[50]

Reported Chinese labor costs varied by source. Officials at two foundry coke plants and one blast furnace coke plant reported labor compensation. Officials at one foundry coke plant reported that workers are paid renminbi (yuan) (RMB) 10 per day.[51] Assuming 20 days of work per month, this would total RMB 200 per month ($24.10). Officials at the blast furnace coke plant reported that workers earn RMB 580 per month ($69.88) exclusive of benefits. Including benefits, total compensation at this plant totaled RMB 759 per worker per month ($91.44)[52] (table 3-10). Officials at another foundry coke plant in China reported total compensation per worker to be approximately RMB 800 per month ($96.37). This plant did not specify how much of this compensation was wages versus benefits. Finally, according to official 1998 Chinese government statistics, the average monthly wage of staff and workers in the mining and quarrying sector was RMB 603.5 ($72.71), while the average for the manufacturing sector was RMB 588.67 ($70.92).[53]

[50] Commission interviews with Chinese coke producers in China, March 2000.

[51] Commission fieldwork, Shanxi, China, March 2000.

[52] Commission fieldwork, Shanxi, China, March 2000. Officials at this plant suggested there would be little difference between the compensation of foundry coke workers and blast furnace coke workers.

[53] *China Statistical Yearbook 1999*, p. 161. The two foundry coke plants reported significantly different labor costs. As a result, a range of labor costs is included in the list of production costs.

Coal Costs

Reported costs of coal also vary by source. Officials from Chinese coke plants of all types reported the cost of coal required for foundry coke production. These reported costs are presented in table 3-11.

Chinese energy pricing reform began in the 1980s, when a multi-track pricing system was partially introduced. In the 1990s, the commitment of the central government to carrying through pricing reform has appeared to strengthen. Coal prices in China have basically been freed since 1993; since then they have risen and leveled off, and show significant regional variation.[54]

Economic reforms in China focused on a “contract responsibility system,” first applied to agriculture, then to manufactured goods and other markets in China. In this system, the initial idea was to provide enterprises with an incentive to raise productivity and output by allowing them to sell their above-plan output on the free market. In the goods market, initially, the portion of output sold at market-determined prices was small and subject to a ceiling of no more than 20 percent over the state-fixed price. In January 1985, the 20-percent limit was phased out, letting prices become a more important signal to both producers and consumers and ultimately the allocation of resources in China. By the end of the late 1980s and early 1990s, most of the planned prices for most capital goods were already eliminated.[55]

[54] *Chinese Energy Databook*, p. VI-2.

[55] Lardy, Nicholas. *China in the World Economy*, Institute for International Economics, 1994, p. 9.

Table 3-10
Total monthly labor compensation of coke workers according to General Nice Co. in China, 1999

(Per month)

	RMB	U.S. dollars[1]
Wages	580.00	$69.88
Benefits		
Health insurance	91.67	$11.04
Social welfare benefits (including some food,oils)	72.29	$8.71
Equipment, clothes, gloves	15.00	$1.81
Total Compensation	758.96	$91.44

[1] Based on official exchange rate of 8.3 RMB/U.S. dollar.

Source: Commission fieldwork, Tianjin, China, March 2000.

Table 3-11
Coal price reported by selected Chinese foundry coke producers/traders

Producer/trader	RMB per metric ton of coal	U.S. dollar per metric ton[1]
Shanxi Xiaoshan Group	153	$18.40
Shanxi Grand Coalchem Industrial Company	100-150	12.05-18.07
Shanxi Economic and Trade Assets Management Co.	120-130	14.46-15.66
Taiyuan Yinxian Coal-Carbonization Group Corporation	110-120	13.25-14.46

[1] U.S. dollar prices were calculated using the official exchange rate, 8.3 RMB per dollar.

Source: Commission fieldwork in Beijing, Tianjin, Wuhai, Taiyuan, and Yinchuan, March 2000.

During 1992-93, price liberalization was extended to the prices of energy and transportation. This includes coal and coal products such as foundry coke. In the period before reform, coal and crude petroleum were among the most underpriced commodities in China.[56] In the mid-1980s, when small amounts of above-plan output were sold freely on the market, the ratio of free-market to planned prices for coal and petroleum was among the highest of all commodities in China. By 1992, serious reform in these markets was undertaken. Steps in coal price deregulation included the following: the share that coal producers were forced to sell at low official prices to preferred, state-designated users was significantly lowered; the controlled price was raised significantly; and price ceilings on sales of above-plan output were raised. By the end of 1993, more than 75 percent of all Chinese coal was being sold at market prices.[57] Coal prices increased at more than twice the rate of industrial goods during the 1990s.

Currently, foundry coke producers in Shanxi Province, especially Qingxu county, which reportedly produces a higher quality foundry coke for export, face higher costs due to the higher quality coal used in the coking process.[58]

According to one American businessman in China, a change since the last Commission study[59] on coke has been that with significant fiscal deficits, the central government in China is now insisting that every ministry becomes profitable. “In this environment, there is no incentive to give subsidies to anyone–especially to another ministry or another Chinese person. Further, coke does not need subsidies; production costs are already very competitive in China, and there is an abundant supply of good coking coal.”[60]

Value Added Tax (VAT) and Export Rebates

Producers of foundry coke in China are subject to a VAT, which is supposed to be partially rebated if coke

[56] In comparison to market prices of coal and crude petroleum.

[57] Lardy, p. 10.

[58] Submission to the Commission from U.S. foundry coke industry representatives, Nov. 1999.

[59] U.S. International Trade Commission, *Metallurgical Coke: Baseline Analysis of U.S. Industry and Imports*, Inv. No. 332-342, March 1994.

[60] Commission interview, Beijing, China, March 2000.

is exported. Officials from Chinese foundry coke plants report, however, that they seldom receive the full rebates designated to them.[61] Before more optimistic July 1999 export totals were released, an official at the Ministry of Foreign Trade and Economic Cooperation announced that further tax rebates would be possible.[62] Since much of Chinese trade is conducted in U.S. dollars and Japanese yen, the RMB price itself becomes less important. The government can make Chinese exports less expensive abroad by giving tax rebates to firms, who can offer their goods at lower prices. Chinese tax procedures pertaining to foundry coke are shown in table 3-12.[63]

Transportation Costs

Most Chinese foundry coke producers are located close together in Shanxi Province, which accounts for virtually all of China's foundry coke exports. These producers often have their own trains and trucks[64] to transport coke to port for export (table 3-13). Within Shanxi Province, Xingang is the primary export port capable of loading 10 vessels simultaneously.[65] There, wharves are equipped to receive bulk carrier vessels for raw material discharging and product loading.

Chinese exports of foundry coke are loaded onto vessels at loading berths and are generally shipped on handy-size vessels, capable of carrying, on average, 38,000 to 40,000 metric tons of bulk product. However, most foundry coke exports are shipped in units of 4,500 to 6,000 metric tons, which occupy, at most, two holds on a handy-size vessel.[66] Transit times for delivery of Chinese foundry coke are approximately 30-35 days for shipments to U.S. east coast and gulf ports, but only 18 days for west coast ports. Some U.S. ports that have received foundry coke from China during 1997-2000 include Richmond/Oakland, CA; New Orleans, LA; Camden, NJ; and Wilmington, DE.[67]

Most Chinese foundry coke exports to U.S. ports are under transportation contracts. According to maritime officials in China, bulk carrier rates are driven by demand for Atlantic Ocean to Pacific Ocean (Atlantic-Pacific) bulk product trade, including grain, iron ore, and coal. Trade in these products from Pacific Ocean ports to Atlantic Ocean ports (”backhaul”) is less frequent, resulting in an imbalance in bulk carrier demand. Consequently, foundry coke shipments from Pacific ports destined for Atlantic ports may obtain lower freight rates than for Atlantic-Pacific transport. Backhaul, handy-size bulk, carrier rates may be only one-half of those for Atlantic-Pacific trade.

In 1999, the U.S. average ocean freight paid for imported foundry coke was approximately $20 per metric ton.[68] Estimated 1999 ocean freight costs for delivery of Chinese coke were $13-28 per metric ton to a west coast port, $26-33 for an east coast port, and $10-19 per metric ton to a Gulf coast port.[69] Though the distance is greater, transportation to Gulf ports is less expensive than that to west coast ports because of competition on routes and the availability of cargo for backhaul. However, rates that include inland transportation in China, vessel loading, inspection, customs fees, etc., are significantly higher.[70] See table 3-14 for representative charges and fees in China.

[61] Commission fieldwork in Shanxi Province, China, March 2000.

[62] "Report: More Tax Rebates Possible If Exports Remain Weak," *Inside China Today*, July 22, 1999.

[63] Commission interviews in Beijing, Tianjin, Taiyuan, and Wuhai, China, March 2000.

[64] In China, one truck can generally carry 10-15 metric tons of coke, and a dedicated freight train can carry 2,500 metric tons. B. Goswami, *Chinese Coke 1999 Directory*, p. C.

[65] B. Goswami, *Chinese Coke 1999 Directory*, p. C.

[66] Commission interviews with U.S. industry officials.

[67] Commission interviews with officials from the American Coke and Coal Chemicals Institute.

[68] Data compiled from responses to Commission questionnaires.

[69] These costs are the difference between c.i.f. value at the first U.S. port of entry and customs value in China, and do not include inland transportation costs.

[70] Handling and associated fees at U.S. ports are approximately $3-5 per metric ton for foundry coke.

Table 3-12
Chinese tax procedures on foundry coke plants

Item	Value
Value added tax on coke sales	+17 percent
Adjustments:	
Raw materials entry tax adjustment	-13 percent of raw materials price
Transportation tax adjustment	-10 percent of transportation cost
Export tax rebate	-9 percent rebate of export value

Source: Commission staff interviews, China, March 2000.

Table 3-13
Foundry coke: Shanxi province plants: method of transport to port of Xingang, 1999

Plant	Method of transport
Ying Xian Coal Carbonization Co. Ltd.	Trucks
China Shanxi Military Farm Operating Coking Plant	Trucks
Ying Dong Coking Plant	Trucks
Yuan Hui Coke Plant	Trucks
Shanxi Tan Xin Coking Co., Ltd.	Trucks and trains; 24 locomotives with 50 cars each
Shanxi Sanjia Coal-Chemistry Co., Ltd.	Trains; company owns 5 trains of 250 cars
Shanxi Xiaoshan Coal-Chemistry Co., Ltd.	Company has 5 trains (218 cars), and 3 1-km long platforms for exclusive use; co. also owns over 200 trucks for transport to warehouse
Sino-Germany Joint Venture Shanxi Jie Xiu Sansheng Coking Co., Ltd.	Railway; co. has three freight trains; does not use trucks
Ping Yao Hua Feng Coking Plant	Trains; owns 48 railcars, and 20 large size trucks
Ping Yao Feng Yan Coking Plant	Trains and trucks
Zhong Pu Coking Co., Ltd.	Company owns 20 large trucks
Jia Wei Coking Plant	Trucks
Shanxi Top-Reach Coalification Co., Ltd. (De Rui)	Company owns 153 trucks
Fu You Coking Co., Ltd.	Trucks
Li Shi City Ju Fu Coking Plant	Trucks
Shanxi Li Shi Liangyu Jiao Hua Chang	By own trucks
Ying Xing Coking Plant	Trucks
Shanxi Jin Yang Coking Plant Industrial Co., Ltd.	Trucks
Zhongyang County Shuang Fa Coal and Coke Co., Ltd.	Trains and trucks
Shanxi Feng Yang Wen Feng Coking Plant	Company has 45 trucks
Shanxi China Bei Zhang Coking Co., Wen Shui	Trucks
Yao Long Coke Plant	By own trucks
Bao Wan Coking Plant	Trucks
Huang He Coking Plant	Trucks
Wen Fei Coking Plant	Not specified

Source: B. Goswami, *Chinese Coke 1999 Directory*, various pages.

Table 3-14
Foundry coke: Transportation and ancillary costs in China, 1999

Item	RMB	U.S. dollars
Transportation to port[1]	125-225	15.06-27.11
Port authority fees	4.5	0.54
Customs Commission inspection	44.5	5.36
Fuel fee	3.0	0.36
Warehouse fee	5.0	0.60
Discharge	1.0	0.12
Other handling fees	22.2	2.67
Total	205-305	24.79-36.76

[1] Costs vary with distance shipped.

Note.—U.S. Dollar values are computed, based on the official Chinese exchange rate of 8.3 RMB per dollar

Source: Shanxi Xiaoshan Group, Inc., Taiyuan, China, and Commission interviews with Chinese industry representatives.

In 1999, landed value for foundry coke, including ocean freight, was informally reported for U.S. ports as follows: on the West Coast, if purchased c.i.f. on the dock, $105 per metric ton plus approximately $12 per metric ton unloading; at New Orleans, $95 per metric ton including loading on a barge; and at an East Coast port, if purchased c.i.f. on the dock, $110 per metric ton plus approximately $10 per metric ton unloading.[71] It generally costs approximately $1-2 per metric ton to reload from the storage facility to truck or rail, and storage costs vary significantly from port to port.[72]

Factors Affecting Foundry Coke Trends

Market Dynamics

The rapid growth in Chinese coke exports of all types of coke in the late 1980s and early 1990s was due to several factors such as labor costs, devaluation of the Chinese currency in 1994, and government deregulation that awarded more export licenses to producers in the coke industry.[73] In addition, increased demand for higher quality product by foreign buyers resulted in improved quality and equipment.

The pressure from foreign buyers to improve Chinese coke quality including that of foundry coke prompted a March 1992 Chinese coke industry convention organized by CCIB/CCIC of Shanxi and IIC. The meeting garnered support from the Provincial Shanxi Government, and was attended by major Chinese coke producers of all types. Coke quality was soon improved with the introduction of mechanical screening facilities and testing laboratories. Conditions at the major coke port in Xingang were also improved. Storage facilities at the port were equipped with cement floors. By 1992, Xingang handled about 2.1 million metric tons of coke exports, a record for the industry. Officials from various Chinese coke plants reported an improvement in foreign perception of Chinese coke quality during this period.[74] In addition, production costs continued to rise in industrialized countries. As a result, demand for all Chinese coke, including foundry coke, increased.[75]

In 1993 and 1994, a drive for better quality, low-ash (under 10.5 percent) coke was underway to satisfy the demands of foreign buyers. Those firms already producing low-ash coke garnered long term foreign contracts, while new producers began producing better coke. By 1996, low-ash coke became a self-imposed industry standard for the Chinese coke industry.[76]

A global slowdown in 1996 reduced Chinese exports, and several smaller plants closed down. In 1997, demand returned, with more buyers asking for 12-percent-ash coke. Buyers were apparently more confident in Chinese coke quality, and were willing to accept higher ash content in exchange for a lower price.[77]

However, Asian currencies began to collapse in the summer of 1997, weakening regional output into 1998 and 1999. The Asian financial crisis caused a decline in construction and manufacturing in the region, resulting in a drop in the demand for iron and steel. Other than in the United States, where the economy remained strong, markets around the world were quite weak, and blast coke prices dropped over 20 percent.[78] The decline in Asian demand may also have prompted China to focus on the United States as a healthier export market.[79]

Other events have also affected the Chinese foundry coke industry in the last five years. Successive announcements of environmental regulations could possibly result in a decrease in production capacity and coke supply. Government rules giving rail transport priority to the coal industry over coke has reportedly caused periodic bottlenecks in Chinese supply as well. Finally, an increased use of export rebates on the VAT has helped increase foreign demand for many Chinese goods, including foundry coke.

Coke Pricing

In terms of prices, officials at the United States-China Business Council in Beijing indicate that coke is still not a "screen-traded" commodity, and therefore there are no formal pricing standards or established pricing lists. Pricing decisions are based on the interactions of buyers and sellers, and take into account quality, amount, credit terms, and other factors.[80] Besides the cost of coal and transportation, other determinants of Chinese coke prices include bagging requirements,

[71] Commission interviews with U.S. industry officials.
[72] Ibid.
[73] Commission fieldwork, interviews with Chinese foundry coke producers, traders, and government regulators, China, March 2000.
[74] B. Goswami, *Chinese Coke 1999 Directory*, p. D.
[75] Ibid.
[76] Ibid.
[77] Ibid.
[78] Commission fieldwork in Shanxi, March 2000; Commission interviews with U.S. coke producer, Washington DC, May 13, 2000.
[79] Commission interviews with U.S. producers of foundry coke, Nov. 1999 and March 2000.
[80] United States-China Business Council. Commission interviews, Beijing, China, March 2000.

capital expenditures, type of coke ovens, labor costs, social costs, contract issues, energy and other fees, the VAT treatment, and export rebate policies.

Table 3-15 shows a relatively broad range of Chinese foundry coke prices reported by various Chinese sources.[81] Several Chinese producers reported that coke prices are determined outside of China by foreign demand.[82]

Officials at several Chinese coke plants explained that the prices of both blast furnace and foundry coke experienced a significant decline during 1992-96 followed by a partial rebound since 1996.[83] Figure 3-3 shows Chinese coke prices (all types of coke) from December 1996 to March 2000. During 1996-99, the average price for all types of Chinese coke declined from almost $80 per metric ton f.o.b. to below $50 per ton (figure 3-3). Prices are increasing in 2000.[84] According to the Chinese officials, prices for foundry coke are usually slightly higher than blast furnace coke, but have followed a similar trend since 1996.

According to officials at a Chinese coke trading company in Tianjin, foundry coke was $73-$75 per metric ton (f.o.b.) in March 2000.[85] Three months earlier, the price for foundry coke was $68-$70 per metric ton, while two to three years ago, the price was as high as $80-$83 per metric ton. The lowest price in the market before this apparent rebound was $65-$66 per metric ton in late 1999.[86] The view of this trader, confirmed by many others in China, was that the longer term trend of prices would not be clear until later in 2000, particularly given the uncertainty regarding the pending closure of additional beehive ovens.

[81] Commission fieldwork, Beijing, Tianjin, and Shanxi Province, China, March 2000.

[82] Ibid.

[83] Ibid.

[84] Price trend data are from Krupp Wilputte.

[85] The lower the ash content, and the larger the size, the greater the price.

[86] Commission fieldwork, interview with Chinese coke trader in Tianjin, China, March 2000.

Contributing factors to the price of Chinese coke include abundant, inexpensive coal in China; short transportation distances for coal; favorable shipping conditions for coke; inexpensive labor in China; and differences in environmental regulations compared with those in the United States. A decline in prices during 1996-99 roughly coincides with the timing of the Asian financial crisis. Chinese producers also report a decline in coke demand in this period.[87]

Factors cited as contributing to price increases in 2000 include supply shocks from stricter enforcement of environmental regulations, the closure of older beehive ovens, the associated reduction in production capacity, and less production.[88] Two other factors cited in the latest price increases are a shortage of trains and transport infrastructure available to the coke industry and increased domestic and global demand. With a reportedly higher priority given to the transport of coal, coke producers have found it increasingly difficult to transport their output to Tianjin and the ports at Xingang, effectively reducing supply and resulting in higher prices. On the demand side, as Asian economies recover, their demand for foundry coke has been increasing.[89]

Officials at several Chinese foundry coke plants reported that during 1997-98, most Chinese foundry coke exports were arranged on long-term contract sales. One foundry coke trader emphasized a distinction between small-scale exporters with little overhead, and larger scale firms whose higher fixed costs require the more stable, predictable sales associated with long-term contracts. Coke speculators near the ports of

[87] Commission fieldwork in China. Interviews with Chinese coke producers and government regulators, March 2000.

[88] Ibid.

[89] Total Chinese exports in March 2000 were 35.5 percent higher than those a year earlier. Some of this is attributable to export rebates and other trade policies in China, but much is due to increased exports to recovering Asian economies. Data obtained from Orbis Publications, *China Watch*, May 15, 2000.

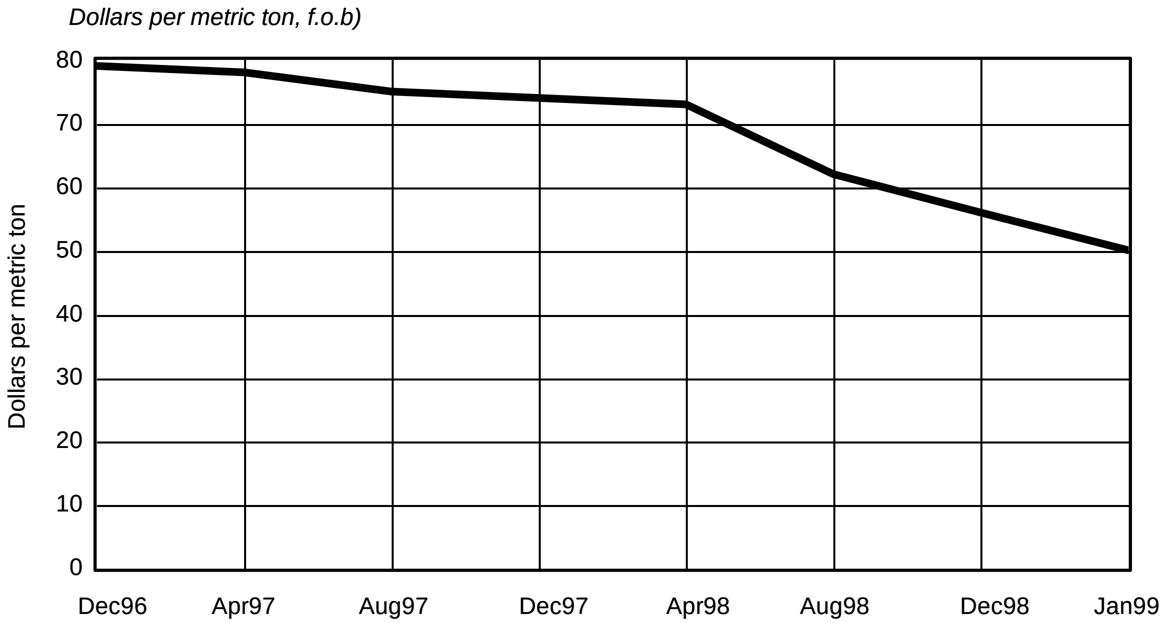
Table 3-15
Sample prices of Chinese foundry coke, 1999

(Dollars per metric ton)

Reported by	Price
Shanxi Economic Trade Assets Management Co.	$80 (f.o.b.)
General Nice	$73-$75 (f.o.b.)
Tianjin Representative of Shanxi MMT	$95-$100 (c.i.f.)
Shanxi Xiaoshan Group	$102 (c.i.f.)

Source: Commission interviews in China, March 2000.

Figure 3-3
Chinese coke prices (all types of coke), December 1996 - January 1999



Source: Robert Weinhieffer of Krupp Wilputte, *Restructing the Coke Industry into the Year 2000.*

Xingang have contributed to the increase in sales on the spot market. According to one trader, there are about 100 speculative operations trying to make coke sales around the ports near Tianjin.[90]

Cokemaking and the Environment

China enacted its first Environmental Protection Law in 1979 and incorporated environmental policy into the country's constitution in 1983.[91] Since then, the National People's Congress has enacted nearly two dozen pollution control and natural resource conservation statutes. However, despite these actions, the creation of the State Environmental Protection Administration (SEPA), and a network of environmental officials throughout the country, environmental compliance reportedly remains low as economic development remains the top priority at all levels of industry and government.[92]

China's highest level of environmental policymaking is the State Environmental Protection Commission (SEPC) of the State Council.[93] SEPC provides policy direction and resolves interagency disputes. SEPA, a ministerial-level authority directly under the SEPC, is responsible for such activities as developing environmental regulations, conducting research, and maintaining environmental data bases.[94] Provincial Environmental Protection Bureaus (EPBs) implement national policies and can set standards more stringent than those promulgated at the national level. The provincial EPBs reportedly supervise local municipal EPBs, and sub-municipal Environmental Protection Offices (EPOs), which are responsible for enforcement.[95] Two supra-ministerial bodies, the State Science and Technology Commission (SSTC) and the State Planning Commission (SPC), also play important roles in developing environmental policy and establishing environmental standards for industry.[96]

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[90] Commission fieldwork, interviews with coke producers in Taiyuan, Shanxi Province, China, March 2000.

[91] U.S. DOC, *China Environmental Technologies Export Market Plan*, March 1996, p. 2.

[92] World Resources Institute, *China: Laws and Policies to Protect the Environment and Health*, found at http://www.wri.org/wr-98-99/prc2laws.htm, retrieved Jan. 7, 2000, p. 2.

[93] Commission fieldwork, Shanxi Province, March 2000. In 1996, the State Council issued a decree that factories causing environmental pollution be shut down by 2000.

[94] Commission fieldwork, Beijing, China, March 2000.

[95] U.S. DOC, *China Environmental Technologies Export Market Plan*, March 1996, p. 4. There are approximately 2,300 EPBs and EPOs, which creates a large network of environmental offices.

[96] The relationship between SEPA and these two supra-ministerial bodies, and their respective roles in environmental standard setting is unclear.

Enforcement, always the key to environmental compliance, reportedly has been inconsistent in China despite the apparent strength of the central government. China's environmental regulations are enforced indirectly through several intermediate layers of government which could lead to less of a strict adherence to guidance from the central government. SEPA reportedly has limited financial resources, few employees (about 400), and poor coordination with other agencies and its own subordinate bureaus.

Thus, SEPA often defers to the EPBs to devise and enforce environmental standards and to finance environmental improvements.[97]

Links between local governments and ministries and even private enterprises reportedly prevent information about environmental problems from reaching SEPA and often inhibit environmental enforcement, as the ministries and agencies protect enterprises under them from such regulation.[98] Entities jointly owned by local governments and other partners, known as township and village enterprises (TVEs), reportedly produce about half of all Chinese air pollution.[99] However, SEPA pollution figures reportedly do not include the pollution of the TVEs because the TVEs are not regulated by SEPA, but by the Department of Agriculture.[100] SEPA is reportedly urging that the local EPBs be subjected to more stringent administrative control, although the local EPBs would still report to the local governments. However, it is unclear if more stringent reporting and greater accountability would result from such a change.[101]

The EPBs generally are not funded by SEPA but are supported by local governments thus probably impeding environmental enforcement since the polluting enterprises are revenue generators for local governments.[102] EPBs must return 80 percent of the emissions fees and fines collected to the regulated enterprises for investment in pollution prevention measures; the EPBs retain the remaining 20 percent.[103] In addition, the EPBs collect fees from inspection units, monitoring stations, research institutes, and engineering companies.[104]

Environmental initiatives are currently underway. For example, the Chinese government has adopted the Trans-Century Green Plan, which sets targets for environmental protection to be met by 2010.[105] In addition, SEPA is reportedly trying to stabilize the total amount of emissions of several pollutants, including some produced during the coking process, at 1995 levels by 2000. The major air pollutants addressed include soot, industrial dust, and SO_2; the major water pollutants listed are chemical oxygen demand (COD), oil pollutants, cyanide, arsenic, mercury, lead, cadmium, and sexavalent chromium.[106] Moreover, on November 29, 1998, the Chinese government issued environmental protection regulations requiring that new projects use production processes with improved resource utilization and lower levels of pollution.[107]

The Tenth Five-Year Plan, which will cover the period 2001-05, is reportedly on the agenda of the National People's Congress (NPC) for negotiation during the summer of 2000. The coke industry may be facing the prospect of stricter environmental regulations as several new laws are currently being considered.[108] The NPC, and the State Council, are reported to be reviewing possible revisions to air and water pollution laws, a new law affecting the management of chemicals, and some new provisions of the solid waste laws that may affect the handling of hazardous waste.[109]

The proposed revisions to the Air Pollution Prevention and Control Law to be considered in 2000 reportedly include new requirements such as mass-loading targets for each industrial facility based on the maximum amount of pollution that can be discharged into the environment, specific permit and reporting requirements, and discharge fees that apply to the volume of pollution rather than emission concentrations, which is the current requirement. The Water Pollution

[97] U.S. Embassy, Beijing, "The Fading of Chinese Environmental Secrecy," found at http://www.usembassy-china.org.cn/english/sandt/chplca.htm, retrieved Jan. 7, 2000, p. 3.

[98] Ibid., p. 4.

[99] Ibid., p. 5.

[100] Ibid., p. 2.

[101] Stover, Jim, "China's Environmental Framework 2000 and Beyond," draft article for the March/April 2000 issue of the United States-China Business Council's China Business Review, obtained during Commission fieldwork, Beijing, China, March 2000, p. 1.

[102] U.S. DOC, *China Environmental Technologies Export Market Plan*, March 1996, p. 5.

[103] Stover, 2000, p. 1.

[104] U.S. DOC, *China Environmental Technologies Export Market Plan*, March 1996, p. 6.

[105] World Resources Institute, *China: Laws and Policies to Protect the Environment and Health*, found at http://www.wri.org/wr-98-99/prc2laws.htm, retrieved Jan. 7, 2000, p 4.

[106] SEPA, *Ninth Five-Year Plan*, found at http://www.sepaeic.gov.cn/english/plan.totalp-right.htm, retrieved April 1, 2000, p. 1.

[107] Tian-Rui Li, Trend in Coking Industry in Shanxi, China, Paper presented at Coke Outlook 99, New Orleans, LA, Feb. 3-5, 1999.

[108] Commission fieldwork, Beijing, China, March 2000.

[109] Stover, Jim, "China's Environmental Framework 2000 and Beyond," draft article for the March/April 2000 issue of the United States-China Business Council's China Business Review, obtained during Commission fieldwork, Beijing, China, March 2000, p. 2.

Prevention and Control Law, last amended in 1996, is also scheduled for revision before the end of 2001, although no information is available as to the changes that are being considered and whether such changes will affect the foundry coke industry.[110]

The Risk Assessment Baseline of Soil Environmental Quality for Industrial Enterprises (HJ/T25-1999) is China's initial approach to addressing industrial site clean-up, and the standard reportedly includes most of the U.S. EPA priority pollutants as well as methodological requirements for testing and analysis. The law's application to the foundry coke industry is unknown, and it is unclear if this law applies to those sites where primitive coke ovens have been dismantled.[111] Other new laws being considered, which may have some impact on the foundry coke industry, include a new environmental impact assessment law and a proposed Chemical Pollution Prevention and Control Law, which is reportedly based on the U.S. Toxic Substances Control Act (TSCA).[112] Finally, SEPA is one of several agencies that is working to develop a "cleaner production" law that would go beyond the current pollution laws, although current laws do contain both end-of-line and process provisions. Such a law would be consistent with the Catalogue of Outdated Production Capacities, Equipment, and Products which was issued in early 1999.[113]

As noted previously in this chapter, China produces foundry coke primarily in two types of coke plants: mechanical and non-mechanical. The mechanical coke plants utilize byproduct recovery ovens and technology similar to those used in the United States and described in Chapter 1. The non-mechanical coke plants utilize several models of older, non-recovery "primitive" (often termed beehive) ovens and technology that results in significant emissions of harmful air pollutants. The government has focused on promoting new, and more environmentally friendly, coking facilities to replace the older beehive ovens.

According to some reports, the non-recovery ovens are the primary suppliers of Chinese foundry coke exports,[114] and government fieldwork in China confirmed that most of the foundry coke is produced in the non-recovery ovens although the amount of actual production in the various models of the non-recovery ovens is unknown.[115] The environmental impact of the rapid development of the hundreds of such ovens built since the late 1980s has been significant and has reportedly led to the development of more stringent environmental regulations for the coke industry. These ovens, many of which are termed "improved" coke ovens, reportedly produce less pollution than the older, more primitive ovens by combusting more of the gases within the oven, and the batteries have flues, and stacks taller than 25 meters, to remove some of the pollutants.[116]

In the non-recovery ovens, the coal charge is heated by burning part of the coal, coke, and gases in contact with air in the coking chamber or oven essentially without recovery of any gas or by-products. The term primitive applies to the several types of ovens that are commonly used in China for the production of foundry coke. The "improved" ovens are often labeled No. 75, No. 89, and No. 96, although the term appears to apply to a number of older beehive ovens. These ovens have cold charging and discharging and there is no heat recovery, no desulfurization of flue gas, and no system for collecting pollutants during charging, quenching, and discharging.[117]

Although most, if not nearly all, foundry coke in China is produced in the non-mechanical ovens, China does have mechanical, or slot, by-product recovery coke ovens in various configurations and sizes of batteries that are capable of producing foundry coke.[118] Most of China's large and medium scale mechanical coke plants are equipped with water pollution control facilities, including such processes as biological dephenolization and biological denitrification. Air pollution control technologies at such facilities reportedly include high pressure ammonia liquor injection smokeless charging, bag houses, and thermal draft hoods over pushing operations. However, only a small share of China's coke is produced in such facilities,[119] and little if any foundry coke is currently produced in facilities with this degree of environmental protection.[120]

In 1996, Shanxi Province issued Provincial Decree No. 30, which paralleled the State Economic and Trade Commission (SETC) decree that pollution was to be controlled by 2000.[121] Then, on June 5, 1997 SETC

[110] Ibid.

[111] Ibid., p. 4.

[112] Ibid., p. 3.

[113] Ibid., p. 4.

[114] Larrison, Jeff, Foundry Coke Supply, Paper presented at Coke Outlook 99, New Orleans, LA, Feb. 3-5, 1999.

[115] Commission fieldwork, Shanxi Province, China, March 2000.

[116] Ibid.

[117] Hongchun Liu, Chengyou Cai, and Wenhua Zheng, "China's Coking Industry Stepping Into the New Century," Coke Making International, May 2000, draft article, p. 2.

[118] Commission fieldwork, Shanxi Province, China, March 2000.

[119] Hongchun Liu, Chengyou Cai, and Wenhua Zheng, "China's Coking Industry Stepping Into the New Century," Coke Making International, May 2000, draft article, p. 2.

[120] Commission fieldwork, Shanxi Province, China, March 2000.

[121] Ibid.

issued its first list of production processes and equipment to be eliminated because of their effects on the environment. The list contained 15 items, including certain coke ovens. For example, the regulation required that No. 75 and No. 89-type (non-recovery) coke ovens be replaced by December 31, 1999.[122] However, data are not available to determine the number of plants affected by these regulations, although one author estimated that nearly 30 percent of the beehive coke plants would be affected or closed by that date.[123] A second report in November 1999 stated that the older beehive ovens have been shut down.[124] If all such ovens are shut down, Chinese coke production would be expected to fall substantially, with one source estimating that about 60 million metric tons of beehive production capacity could be affected by the regulations and that about 36 million metric tons of beehive production capacity will be closed in response to the regulations.[125] Another source estimated the resulting metallurgical coke shortage in China at 40 million tons.[126] China is also reported to be closing all mechanical coke ovens with chamber heights of less than 2 meters by 2002,[127] however, the effect on foundry coke production of such closures is unknown since it is not clear that foundry coke is produced in facilities with the shorter ovens.

However, as of March 2000, many of the non-recovery plants were still operating, although a large number of idled and dismantled facilities were seen in Shanxi Province.[128] Officials in Shanxi Province estimated that about one-third of the affected plants had been dismantled with the goal that the remaining beehive plants on the list would be closed by the end of 2000.[129] The most primitive production (in pits) has been banned as has coke production in facilities with carbonization rooms (ovens) less than 4 meters high/long.[130] Another State Council decree, issued in 2000, calls for the rehabilitation of all facilities using natural and improved ovens, and officials in Shanxi Province stated that their goal is to end beehive production in the province in 2001.[131] However, it appears that the closures, at least to date, may be limited to those facilities within one kilometer of the main roads.[132] It is also apparent that mechanical coke capacity can not be built in time to replace the scheduled closure of the primitive facilities, and it appears that replacements for the closed capacity may, at least in the interim, consist of ovens such as the SJ-96 described below.

The extent to which foundry coke capacity and production have been affected by the closures is unclear. The foundry coke produced, particularly that for export, is reportedly produced in the newer models of the “improved” beehives that are likely to be the last models to be dismantled. The extent of the capacity permanently closed also remains unclear, since data on the number of ovens of each of the beehive models are unavailable.[133] Some have reported that the primitive ovens are to be mainly replaced by mechanical coke ovens with chamber heights of 4.3 meters and widths of 0.5 meters.[134] In addition, designs have been developed and plans are being made for a new, cleaner, non-recovery oven, with one such facility to begin production before the end of 2000.[135]

One such oven may be the SJ-96 non-recovery oven developed by Shanxi Sanjia Coal Chemistry Company Ltd. in Shanxi Province. The company reports that this oven can produce both blast furnace coke and foundry coke and meet the national emission standards.[136] The cost of constructing SJ-96 ovens is reported to be RMB 42 ($5.00) per metric ton of annual production. The ovens, which appear to be another improved variation of the non-mechanical technology, are grouped in two rows of 12 connecting to a 45 meter

[122] Tian-Rui Li, “Trend in Coking Industry in Shanxi, China,” Paper presented at Coke Outlook 99, New Orleans, LA, Feb. 3-5, 1999.

[123] B. Goswami, *Chinese Coke 1999 Directory*, p. F.

[124] *American Metal Market News*, Vol 107, I 2111, November 1999, p. 6.

[125] Tian-Rui Li, “Trend in Coking Industry in Shanxi, China,” Paper presented at Coke Outlook 99, New Orleans, LA, Feb. 3-5, 1999.

[126] Li Hongchun, “Present Status and Projection of the Chinese Coke Market”, *China Chemical Reporter*, May 16, 1999.

[127] Hongchun Liu, Chengyou Cai, and Wenhua Zheng, “China’s Coking Industry Stepping Into the New Century,” Coke Making International, May 2000, draft article, p. 4.

[128] Commission fieldwork, Shanxi Province, China, March 2000.

[129] Ibid.

[130] Ibid.

[131] Ibid.

[132] Commission fieldwork and interviews, Shanxi Province, China, March 2000, and Washington, DC, May 2000.

[133] According to one Chinese industry representative, there are currently fewer that 800 foundry coke ovens operating in Shanxi Province. Commission fieldwork in China, March 2000.

[134] Hongchun Liu, Chengyou Cai, and Wenhua Zheng, “China’s Coking Industry Stepping Into the New Century,” Coke Making International, May 2000, draft article, p. 4.

[135] Commission fieldwork, Shanxi Province, China, March 2000.

[136] Yan Jiying and Song Weijie, “Coal Making into the 21st Century–Environment Protection Efforts at Shanxi Sanjia CoalChemistry Co. Ltd.,” (The Iron and Steel Society: 59th Ironmaking Conference Proceedings, Vol. 59, Mar. 26-29, 2000, Pittsburgh, PA), p. 285.

stack, and ignition is done by directing high temperature gases from a neighboring oven. Each oven is 22.6 meters long, 3 meters high, and 3 meters wide. The ovens are charged and discharged cold. After a coking cycle of 8 to 16 days, depending upon the product, the coke is cooled with injections of water, and the coke is discharged manually with small dumper cars.[137] The steps taken to enhance the environmental performance of this type of oven include the use of coal with a sulfur content no greater than 0.55 percent, coal washing, temperature control in the oven and an exhaust tunnel to ensure gas splitting before the gas is exhausted through the stack, and recirculation of the quench water.[138]

Air-Pollutant Emissions

In August 1996, the State Council issued new environmental protection regulations affecting air emissions. Ten major areas were addressed, with a stated intention of bringing all effluent and air emissions by industries into compliance by the year 2000.[139] On January 1, 1997, the central government (SEPA) issued Air Emission Standards for Pollutants from Coke Ovens, (GB1671-1966).[140] The standards covered existing and new coke facilities for both mechanical ovens (table 3-16) and non-mechanical ovens (table 3-17).

The air standards differ according to the classification of the functional use of the geographic area in which the plant is located. First grade denotes areas such as national reserves, specially reserved areas, or scenic spots. Second grade, which covers the major areas of the country, denotes residential, commercial, cultural areas and includes the rural countryside. Third grade denotes specified industrial areas of which there are very few in China.[141]

It is difficult to compare the air emission standards shown in the tables with standards in the United States or to get a sense of just how these standards are to be implemented; however, there are factors that should be noted. First, in contrast to the qualitative approach in the United States for the regulation of hazardous air pollutants created during the coking process, the emission standards for the organic compounds and particulates shown in the tables 3-16 and 3-17 appear to be on a quantitative basis relative to the tonnage of coke produced. Second, these are national standards, and as noted above, the provincial EPBs are charged with implementing these guidelines. It is also unclear just how the provinces, particularly Shanxi Province, the center of the foundry coke industry in China, have implemented the rules and established procedures. For example, the frequency of environmental audits, inspections or verifications is unknown, although some producers said such inspections occurred annually, at a minimum.[142]

Water-Pollutant Emissions

Since the basic coking processes in China are similar to those in the United States, it is likely that the wastewater streams contain similar concentrations of COD, ammonia, phenols, cyanide, and some organic materials. China's ambient water quality standards are reportedly more closely aligned with international practice. The current standards for discharges of wastewater from industrial facilities were set by a regulation that was approved in May 1992 (table 3-18). As in the United States, the quality of the water body receiving the wastewater discharges is one factor in the determination of the standard, and thus the standards can be expected to vary throughout the country.

The wastewater streams are subjected to a biological treatment process, as is common in the United States, before being released into the receiving waters.[143] The regulations call for sampling and testing of wastewater at different intervals, depending upon the length of the production cycle, with testing required once every two hours for those cycles that are less than eight hours and once every four hours for those cycles that are longer than eight hours. However, the EPBs are responsible for local monitoring and inspections and the timing or frequency of emissions tests or environmental evaluations reportedly varies according to local capability. If local capability is strong, testing reportedly occurs once per month, and if local capability is weak, testing reportedly occurs once every two or three months.[144]

The water discharge standards appear to be aimed at mechanical coke plants (slot ovens), and as such, may have little application to foundry coke production, which is essentially all produced in non-mechanical (beehive) ovens. Since the waste gases are not collected and processed into byproducts at coke plants

137 Ibid., p. 286.
138 Ibid., p. 287.
139 Tian-Rui Li, "Trend in Coking Industry in Shanxi, China," Paper presented at Coke Outlook 99, New Orleans, LA, Feb. 3-5, 1999.
140 Ibid.
141 Commission fieldwork, Beijing, China, March 2000.
142 Commission fieldwork, Shanxi Province, China, March 2000.
143 Commission fieldwork, Beijing, China, March 2000.
144 Ibid.

Table 3-16
Air emission standards for mechanical coke ovens

		Existing plants			New plants		
Pollutant	**Unit**	**First grade**	**Second grade**	**Third grade**	**First grade**	**Second grade**	**Third grade**
Particulates	kg/t	1	3.5	5	([1])	3.5	5
Benzene soluble organics	mg/m^3	0.25	0.8	1.2	([1])	0.8	1.2
Benzo-a-pyrene		0.001	0.004	0.0055	([1])	0.004	0.0055

[1] Not available; however currently unsure as to whether this grade is applicable to new coke plants, as it may mean that no new plants are allowed in areas classified as First Grade.

Source: Tian-Rui Li, 1999, pp. 3 & 4.

Table 3-17
Air emission standards for non-mechanical coke oven

		Existing plants			New plants		
Pollutant	**Unit**	**First grade**	**Second grade**	**Third grade**	**First grade**	**Second grade**	**Third grade**
Particulates	mg/m^3	100	300	350		250	300
	kg/t	1.2	3.5	4.0	([1])	3.0	3.5
Benzene Soluble Organics	mg/m^3	240	500	600		450	([2])
	kg/t	3.0	5.5	6.5	([1])	4.5	5.0
Benzo-a-pyrene	mg/m^3	1.00	2.00	3.00		1.50	2.00
	kg/t	0.010	0.020	0.025	([1])	0.015	0.020
Greenman Blackness	-	<=1	<=1	<=1	([1])	<=1	<=1

[1] Not available; however currently unsure as to whether this grade is applicable to new coke plants, as it may mean that no new plants are allowed in areas classified as First Grade.
[2] Not available.

Source: Tian-Rui Li, 1999, pp. 4 & 5.

Table 3-18
Discharge standards for water pollutants from the coking industry

Period[1]	Grade[2]	Minimun allowable recycle rate of water or discharge of wastewater[3]	Maximum allowable discharge concentration (mg/l)								
			pH	SS	Volatile phenol	Cyanide	COD_{cr}	Oils	CR^{6+}	NH_3-N	Zn
Before1/1/89	A	Water-short[4] region	6-9	150	1.0	0.5	150	15	0.5	-	-
	B	(85%	6-9	300	1.0	0.5	200	20	0.5	[6]3	-
	C	Water plentitude[5] region (60%)	6-9	400	2.0	1.0	500	30	-	[6]5	-
1/1/89 through 6/30/97[7]	A	Water-short region	6-9	70	0.5	0.5	100	10	0.5	15	2.0
	B	(90%)	6-9	200	0.5	0.5	150	10	0.5	40	4.0
	C	Water plentitude region (80%)	6-9	400	1.0	1.0	500	30	-	150	5.0
Since 7/1/92[8]	A	Water-short region	6-9	70	0.5	0.5	100	8	0.5	15	2.0
	B	($0.3m^3$/t)	6-9	150	0.5	0.5	150	10	0.5	25	4.0
	C	Water plentitude region ($0.4m^3$/t)	6-9	400	0.5	2.0	500	30	1.0	40	5.0

[1] The standards apply to projects approved by the dates and those operating during these periods.

[2] The standards are divided into three grades, which apply to combinations of the five categories of receiving waters: wastewater discharged into waters classified as Category II and some areas classified as Category III must meet the standards for Grade A, discharges into Category IV and V waters and some in Category II must meet Grade B standards, and wastewater discharged to a municipal secondary sewage treatment plant must meet Grade C standards.

[3] The standard was changed from a percentage of water that was to be recycled to a volume of discharge permitted per metric ton of production.

[4] Water-short regions are those areas where the water is taken from reservoirs and groundwater, and the regions are defined by the responsible national water resource administration.

[5] Water plentitude regions are those where large rivers are used as water sources, like Yangtze River, Yellow River, Zhu River, Xiang River, and Songhua River.

[6] For the pre-1989 period the standard was for total nitrogen compounds.

[7] The standard for NH_3 related to coking was enforced on January 1, 1994.

[8] A separate standard was identified for coking plants in 1992. It appears that the standards for the broader iron and steel complex applied to coking (including by-product plants) prior to that time.

Source: Compiled by Commission staff from National Standard of the People's Republic of China, GB 13456-92 and from staff interview, Beijing, China, Mar. 24,2000.

operating the beehive and improved coke ovens, there is no wastewater discharge as with a byproducts plant. In addition, quench water from these operations does not appear to be collected and processed.[145]

Solid and Hazardous Waste

Solid and hazardous waste generally ranked behind water and air pollution in China's national environmental priorities. Hazardous waste regulation was initiated in China in 1996 under the Solid Waste Pollution Prevention and Control Law. This law calls for responsible treatment of hazardous waste. The extent of the problems, particularly those associated with hazardous waste, is unclear since China lacked detailed tracking or reporting requirements until the late 1990s.

[145] Commission fieldwork, Shanxi Province, China, March 2000.

Pollution Abatement Costs

Data are not available to determine expenditures by Chinese coke producers to meet environmental standards and regulations. The Commission's questionnaire for foreign producers requested information on such expenditures for air pollution abatement, water pollution abatement, and handling of solid waste; however, no response was obtained from those questionnaires.

CHAPTER 4
CONDITIONS OF COMPETITION BETWEEN THE U.S. AND CHINESE FOUNDRY COKE INDUSTRIES

Introduction

Competition between the United States and China in the U.S. foundry coke market has a relatively short history, dating back to 1997, the first year in which the United States imported foundry coke from China. Although more than half of current Chinese foundry coke production capacity was built after 1990, China is now the world's largest exporter of foundry coke[1] and other cokes[2] and the largest U.S. import supplier of foundry coke, supplying about 11 percent of the U.S. market.

Table 4-1 provides a comparative summary of major features of the U.S. and Chinese foundry coke industries and factors affecting the markets in the two countries. A more descriptive comparison follows, addressing various supply-side and demand-side factors such as production capacity, production costs, technology, transportation issues, and coke consumption. Also examined are governmental policies such as environmental regulations, as well as market perceptions regarding differences between Chinese foundry coke and U.S.-produced output.

Supply-Side Factors

Industry Profile

The U.S. and Chinese foundry coke industries are two of the largest such industries in the world, producing 1.25 million metric tons (1999) and 2.6 to 2.7 million metric tons (1997), respectively (table 4-1). The U.S. foundry coke industry is by far the older of the two industries, with roots dating back to the early 1900s; the Chinese industry did not produce significant quantities until the 1980s. Despite some similarities, there are several fundamental differences in regard to the industry structures. The differences are largely attributed to the age of the industries, the technologies used, the labor market in each country, and the applicable environmental laws and enforcement thereof in each country. Some similarities in terms of structure are that most producer firms in both countries are privately owned, with many vertically or horizontally integrated; many of the firms are located near the source of the coal inputs for lower cost availability, and many have domestic customers located in fairly close proximity.

A comparison of the production methods used by the two industries highlights significant differences. The U.S. industry uses slot ovens, about 605 in number, that allow for the recovery of all volatile materials generated. In the course of maintaining the ovens, many of which were built in the 1940s and 1950s, the U.S. industry has developed several useful technologies, including brick replacement technology for oven walls, reliable sealing techniques, and efficient coal-mixing techniques.

In addition to focusing on expenditures intended to maintain existing ovens and lengthen their lifespan, U.S. firms have spent substantial capital in coal-blending facilities, screening facilities, and other technologies specific to foundry coke. Capital expenditures by U.S. producers increased from $14.2 million in 1995 to $19.9 million in 1997 and then declined to $14.4 million in 1999. Operating costs of the shorter, older ovens in operation may be higher than for the newer, taller ovens, but the newer ovens built during 1995-99 faced a significant initial capital cost disadvantage leading to an indeterminate result with respect to cost competitiveness. The new ovens also reduced the quality of the product owing to the increased size of

[1] B. Goswami, *Chinese Coke 1999 Directory*, pp. 76-110.

[2] Raoul Oreskovic, "The Emergence of China as a Major Coke Supply Source," found at http://www.chinaenergy-resources.com/article.html, retrieved Aug. 13, 1999.

Table 4-1
U.S. and Chinese foundry coke industries and markets

Item	United States	China
Number of firms	6 firms, located in Alabama, Indiana, New York, and Pennsylvania (one additional firm produced only 1999).	25 known firms in Shanxi Province. Almost all foundry coke is produced in central China, primarily in Shanxi Province.
Production capacity	605 slot ovens (14 batteries) Oven ages: 21-59 years 1999 total capacity: 1.6 million metric ton (mt) per year. No plans for increased capacity. Capacity utilization levels fluctuated during 1995-99,declining on an overall basis from 77.6 percent to 76.4 percent.	1,460 non-recovery beehive ovens in Shanxi Province (including some modified to reduce emissions in the immediate area) Oven ages: about 914 (or about 63%) were built in the 1990s. 1997 total capacity: 2.9 million mt per year A significant number of ovens could be closed, depending on compliance with new environmental regulations. Although the actual number of future closures is not known, one source estimated that about 80 percent of all beehive ovens operating in China in1997 were subject to closure because of failure to meet announced environmental regulations.
Production	Foundry coke production levels:[1] 1995: 1.23 million mt 1996: 1.17 million mt 1997: 1.23 million mt 1998: 1.24 million mt 1999: 1.25 million mt. [1] Based on responses to the Commission's questionnaire.	No official statistics were available regarding Chinese production of foundry coke. However, one industry expert estimates that foundry coke production in 1997 amounted to about 2.6 to 2.7 million metric tons. With closures of beehive ovens pending because of environmental regulations, production and production capacity are expected to decline.
Technology	All foundry coke is produced in mechanical, slot ovens. Extensive technology has been developed to prolong older ovens' expected lifespan. Pollution/emissions levels: the byproduct recovery process results in reduced air emissions and other pollutants.	All foundry coke is produced in non-recovery beehive (including some modified to reduce emissions in the immediate area). Mechanical slot ovens exist in China, but are presently used for production of other types of coke. Pollution/emissions levels: higher levels of pollution.

Table 4-1–Continued
U.S. and Chinese foundry coke industries and markets

Item	United States	China
Capital costs	A large share of the capital expended during 1995-99 was spent on maintaining existing facilities and lengthening the lifespan of existing ovens. Responses to Commission questionnaires indicate that capital expenditures by U.S. producers were as follows: 1995: $14.2 million 1996: $12.4 million 1997: $19.9 million 1998: $13.9 million 1999: $14.4 million One U.S. industry source noted that construction of a 250,000 mt battery in the United States would currently cost about $200 to $250 million. U.S. producers have stated that the cost of replacing bricks inside a single mechanical slot oven (which requires significant manual labor) is $1 million.	No official statistics were available regarding capital expenditures by the Chinese coke industry. However, Chinese beehive ovens are simple brick structures and, in comparison to mechanized slot ovens, require little or no expenditures on maintenance. Although no slot ovens are currently used in China to produce foundry coke, Chinese producers expressed interest in future construction. Capital costs of building slot oven batteries were reported by Chinese producers as follows: 225,000 mt battery for $6.0 million; 400,000 mt battery for $18.1 million.
Production costs	U.S. production costs:[1] 1995: $129.30 per mt 1996: $134.27 per mt 1997: $133.32 per mt 1998: $137.63 per mt 1999: $137.85 per mt [1] Based on responses to the Commission's questionnaire.	Chinese foundry coke manufacturers interviewed during Commission fieldwork indicated that production cost ranged from $36 to $55 per metric ton. However, Chinese industry sources estimate that the cost for foundry may be as high as $92 per metric ton at the port when internal transportation and handling costs are included.

Table 4-1–Continued
U.S. and Chinese foundry coke industries and markets

Environmental policies/costs	The U.S. industry is subject to significant environmental regulations on coke oven emission that were enacted in the early 1990's. The industry is now approaching a second phase of regulations affecting emissions, wastewater effluent guidelines, and other environmental issues. Producers report that U.S. regulations add significant costs to the production of coke. According to industry estimates, the foundry coke industry spent from $16.9 to $21.9 million on annual operating costs for pollution abatement during 1995-99. On a per-metric-ton basis, the costs ranged from $13.49 to $17.35 during the same period.	The Chinese national government and provincial governments have announced a growing campaign for environmental protection. A succession of announcements have been directly aimed at the closure of all older models, higher polluting beehive ovens. Significant numbers of ovens have been shut down; Chinese and U.S. sources, however, are still unsure as to overall compliance with these regulations and, in turn, the final number of actual closures.
Transportation costs	The vast majority of U.S.-produced foundry coke is consumed at facilities adjacent to or relatively near coke plants and, therefore, is shipped anywhere from a matter of yards to a few hundred miles. In 1999, about one-half of domestic foundry coke shipments were transported by rail; the rest were shipped by truck. In 1999, the average price to deliver a metric ton of output to the domestic purchaser regardless of distance was $24.81.	Most foundry coke is transported within China by truck, with some transported by rail. Transit times to U.S. ports: To U.S. east coast: 30-35 days To U.S. west coast: 18 days Estimated ocean freight costs: To U.S. east coast: $26-$33 To U.S. west coast: $13-$28 To U.S. gulf coast: $10-$19 The weighted average cost per metric ton in 1999 of shipping U.S. imports of foundry coke from China inland from the port to the plant was about $20, whether by rail or by truck.
Consumption	Foundry coke consumption levels:[1] 1995: 1.12 million mt 1996: 1.09 million mt 1997: 1.14 million mt 1998: 1.15 million mt ([2]) 1999: 1.18 million mt [1] Based on responses to the Commission's questionnaire. [2] Does not include imports There were about 2,950 foundries of all types in the United States in 1997. Foundries accounted for about 99 percent of U.S. foundry coke consumption during 1995-99.	No official statistics were available regarding Chinese consumption of foundry coke. Chinese consumption of foundry coke in 1997 was estimated to amount to no more than 1.3-1.4 million mt. About 10,500 foundries of all types were operating in 1991 (excluding small ones operated by townships).

Table 4-1–Continued
U.S. and Chinese foundry coke industries and markets

Trade	***U.S. imports*[1]** ***U.S. exports*[1]** 1995: 0 103,000 mt 1996: 0 94,000 mt 1997: 23,400 mt 103,000 mt 1998: ([2]) 98,000 mt 1999: 133,000 mt 107,000 mt 1 Based on responses to the Commission's questionnaire. 2 Data cannot be disclosed. The ratio of imports to consumption increased from zero in 1995-96 to 2 percent in 1997 before increasing to11.3 percent in 1999. The ratio of exports to production was approximately 8 to 9 percent during the period.	No official statistics were available regarding Chinese imports or exports of foundry coke. No evidence was collected during Commission fieldwork in China to suggest that China imports foundry coke. One estimate states that 1997 exports of foundry coke from Shanxi Province, the Chinese region that accounts for nearly all Chinese exports of foundry coke, amounted to 1.2 million mt. Industry representatives estimated that the three largest export markets for Chinese foundry coke in 1999 were as follows: Japan: 750,000-800,000 mt EU: 350,000 mt United States: 100,000 mt Other Chinese export markets in that year included India, the Republic of Korea, Brazil, and Taiwan.
Coke pricing	U.S. domestic prices:[1] ***Contract*** ***Spot*** 1995: $175.81 per mt $182.20 per mt 1996: $181.01 per mt $174.94 per mt 1997: $184.00 per mt $184.85 per mt 1998: $185.74 per mt $191.32 per mt 1999: $176.12 per mt $187.33 per mt [1] Weighted average unit values based on responses to the Commission's questionnaire.	Weighted average unit values of U.S. imports from China, c.i.f.:[1] 1997: $123.48 per mt 1998: ([2]) 1999: $108.26 per mt [1] Based on responses to the Commission's questionnaire. [2] Data cannot be disclosed, but purchasers reported paying less than $100 per metric ton for Chinese foundry coke.
Differences in product	Quality of U.S.-produced foundry coke is considered superior to that produced in China. Respondents to Commission questionnaires suggested, however, that Chinese and U.S. foundry coke are generally "comparable" in terms of availability, delivery terms, delivery times, discounts offered, packaging, product consistency, and reliability of supply.	Chinese foundry coke quality is considered inferior to that produced in the United States.

the coking chamber and the shorter coking time. Research and development expenditures climbed continuously during 1995-99, increasing from $117,000 to $1.4 million.

The Chinese foundry coke industry depends heavily on nonrecovery beehive ovens and modified versions of beehive ovens, a technology no longer used in the United States. About 1,460 such ovens were operational in 1997 in Shanxi Province, which provides virtually all Chinese foundry coke production and about 90 percent of exports. Slot ovens are currently used on a small scale in China; their use is restricted to the production of coke other than foundry coke. Industry representatives in China have noted that although it would not be difficult to shift foundry coke production to slot ovens, current market conditions do not favor such a switch, primarily because the current price differential between foundry and furnace coke is not that large. This situation favors the production of furnace coke. The firms can produce more furnace coke in less time to maximize profits. This situation could change in the near future, however, if recently implemented environmental regulations are enforced. Beehive ovens consume up to 30 percent more coal and emit several times more pollutants per unit of output than slot ovens.[3]

Capital costs reported for the Chinese industry are lower than those associated with the U.S. industry.[4] The maintenance of beehive ovens is less expensive than that of slot ovens. Moreover, initial capital costs required to construct slot ovens in China are also lower than those in the United States, mainly because of lower construction costs. According to Chinese industry sources, the cost of constructing slot ovens in China ranges from about $6.0 million (for a 225,000-metric-ton battery) to about $18 million (for a 400,000-metric-ton battery).[5] In comparison, one U.S. industry source noted that construction of a 70-oven battery (approximately 250,000 metric tons) in the United States would currently cost about $200 to $250 million.[6] However, if the Chinese industry is to meet China's new environmental regulations, it will have to make significant expenditures in the future to replace beehive ovens with slot ovens. Maintenance costs are also high in the United States: U.S. producers indicated that the cost of replacing a brick wall inside a single slot oven (which requires significant manual labor) amounts to approximately $1 million.[7]

The foundry coke industries in the two countries also differ in regard to export markets, mainly in terms of geographical distances covered. The U.S. industry, for example, exports to Mexico and Canada, markets that are geographically close to the industry. The Chinese industry exports to markets that are located great distances from the domestic industry, including the United States and Europe (see the comparison of transportation costs later in this chapter). Some representatives of the Chinese industry have stated that the increased exports of foundry coke to the United States during 1998-99 were temporary, primarily resulting from decreased consumption in many Asian countries because of the Asian financial crisis in those years.

Production Costs

Production costs in the two countries vary, ranging from $36 to $55 per metric ton in China to about $138 per metric ton in the United States in 1999. Internal Chinese transportation and handling costs of about $37 per metric ton for product intended for export would raise the cost to as much as $92 per metric ton at the Chinese port. China has a significant per ton cost advantage in each of the major components of production (i.e., coal input costs, labor, and energy costs). Estimates for these components in 1999 are shown in the following tabulation (in dollars per ton of coke produced):

	United States	China
Raw materials[1]	$90.22	$14.73-$33.13
Direct labor costs	$25.58	$2.65-$10.6
Energy	$5.90	$0.36

[1] In the United States, this cost includes not only coal, but also process water, sulfuric acid, lime, and caustic soda. For China, it is the cost of coal.

As noted in the tabulation, China expends less for each of the major components. In regard to coal, industry sources in China indicate that the two factors which might cause the price of coal used in China to be lower than that used in the United States are the quality of coal used by some of the producers and the relatively low labor costs incurred in mining the coal.[8] With regard to labor costs, China uses more labor to produce foundry coke than U.S. producers, however, Chinese wage rates are significantly lower. Thus, labor cost per unit of foundry coke produced in China is significantly lower. The number of employees in individual Chinese

[3] *China Energy Datebook*, pp. II-3.

[4] Commission interviews with industry representatives in the United States and China.

[5] Commission fieldwork in Tianjin, Shanxi Province, and Inner Mongolia, China, March 2000.

[6] Commission staff telephone interview with an industry representative, May 26, 2000.

[7] Commission fieldwork and interview with representatives of a U.S. foundry coke producer, Nov. 1999.

[8] The major factors determining coal quality for coking include moisture content, sulfur content, and ash content.

foundry coke establishments in 1997 ranged from 65 to 2,000; slightly more than half of the establishments employed 100 to 300 employees.[9] In comparison, one of the larger U.S. producers employs about 400 workers.[10] One source in China stated that employees in the foundry coke sector earned about $70 per month,[11] while the average monthly salary for a worker in a representative U.S. foundry coke plant was $2,750.[12] Labor costs associated with the production of foundry coke in China ranged from $2.65-$10.65 per metric ton of coke produced versus about $25.58 per metric ton in the United States.

Environmental Costs

While there are some similarities between the respective national environmental standards and guidelines that apply to the foundry coke industries in China and the United States, there are also substantial differences. Compared with China, the United States has more comprehensive environmental regulations (which appear to be getting stricter as new emissions standards are promulgated), more rigorous enforcement (daily inspections for air pollution under the requirements of the National Emissions Standards for Hazardous Air Pollutants and more frequent sampling and testing of wastewater), more sophisticated environmental protection technology and equipment in place, and more stringent operating practices.

Both countries have national standards for air-pollution emissions and national standards for wastewater discharges from coking operations. Both countries have some degree of indirect enforcement of their environmental regulations. In the United States, both air-pollution regulations and water-pollution regulations are enforced through the States, with inspections often done by local jurisdictions or independent third-party contractors. In China, local Environmental Protection Bureaus or Environmental Protection Offices are responsible not only for enforcement but for assisting with the financing of environmental protection investments.

The U.S. Environmental Protection Agency (EPA) is scheduled to publish proposed new air-pollution regulations in the fall of 2000 that will affect additional steps in the production process of U.S. foundry coke firms. The EPA is also scheduled to release a new proposed set of effluent limitations guidelines for wastewater being discharged by the coke plants, and is working on new procedures related to the production and handling of some of the chemicals that are produced by the foundry coke industry's by-product recovery plants. The implementation of the new guidelines and enforcement of the new regulations are likely to result in additional capital and operating costs for the foundry coke industry.

China reportedly is also upgrading its environmental laws, regulations, and institutions and developing other policies designed to improve the environmental performance of its industries. New air, water, and solid-waste regulations reportedly are to be considered this year by the National People's Congress. However, uneven enforcement of laws and regulations remains a significant barrier to improved environmental performance of many industries, including foundry coke.[13] It remains to be seen whether stricter standards, if enacted, will be translated into significant investments in both end-of-line and process equipment to reduce the emission of air and water pollutants from plants producing foundry coke. Since the thrust of the current regulations is to dismantle the types of coke ovens that currently produce the vast majority of foundry coke in China, it is unclear as to whether the proposed regulations will have any practical effect on the foundry coke industry.

The technology that dominates foundry coke production in China is inferior to the technology used in the United States, or in other countries. At the plants that utilize the non-recovery ovens of any type, there are few, if any, mechanized facilities, other than some coke-screening equipment,[14] and there are essentially no environmental protection facilities.[15] Thus, the capital and operating costs for environmental protection are minimal for those facilities producing foundry coke in China and add little or nothing to the cost of production of foundry coke. However, the efforts to close these environmentally insensitive ovens and replace at least some of the production capacity with an improved version of the nonmechanical coke ovens or with mechanical byproduct recovery ovens with at

[9] Some of these employees produce products other than foundry coke.

[10] *Citizens Manufacturing Division Fact Sheet—Fiscal 1999*, p. 3.

[11] Commission fieldwork in China, March 2000, *China Statistical Yearbook 1999*, p. 161.

[12] Commission staff telephone conversation with industry representative, June 1, 2000.

[13] U.S. Embassy, Beijing, "The Fading of Chinese Environmental Secrecy," found at http://www.usembassy-china.org.cn/english/sandt/chplca.htm, retrieved Jan. 7, 2000, p. 9, and Commission fieldwork in China, Mar. 2000.

[14] Commission fieldwork in Shanxi Province, China, Mar. 2000.

[15] Hongchun Liu, Chengyou Cai, and Wenhua Zheng, "China's Coking Industry Stepping Into the New Century," draft article, *Coke Making International*, May 2000, p. 2.

least some degree of environmental protection may significantly increase the cost of producing foundry coke in China.

In contrast, the byproduct recovery plants that produce foundry coke in the United States all have substantial investments in equipment, processes, and facilities necessary to meet the requirements of the environmental regulations. These investments, coupled with the operating costs involved, represent a significant portion of the cost of production of foundry coke in the United States. For example, in 1999, the operating costs associated with environmental protection were reported to be about $16 per metric ton of foundry coke produced. This means that the environmental-protection related costs represented more than 10 percent of the total cost of production and nearly 40 percent of the value added to the raw materials (see chapter 2).

Transportation Costs

Although a significant proportion of U.S.-produced coke is still consumed at foundries a short distance from the source of supply, some domestic foundries are increasingly purchasing from distant Chinese suppliers. Despite the difference in distance traveled by imports and domestic shipments, the cost effectiveness of ocean freight mitigates the disadvantage of long shipping distances from China to certain domestic consumers. Estimated 1999 ocean freight rates for delivery of Chinese coke were $18 to $28 per metric ton to a west coast port, $26 to $33 per metric ton to an east coast port, and $10 to $19 per metric ton to a Gulf Coast port.[16] The weighted average cost in 1999 of shipping imported foundry coke inland from the port to the plant was about $20, whether by rail or by truck. In certain transactions, firms purchasing domestic coke may actually face higher transportation costs than if they purchase the imported product. For example, a west coast purchaser generally pays total transportation costs of less than $40 per metric ton for Chinese coke, whereas railroad rates for shipping domestic coke from east of the Mississippi to a west coast purchaser can easily exceed $60 per ton.[17] However, for U.S. producers and consumers operating in the same vicinity, freight rates can be as low as $3.00 per ton,[18] yielding a significant transportation advantage over imported coke.

[16] These costs are the difference between c.i.f. value at the first U.S. port of entry and customs value in China, and do not include inland transportation costs.

[17] Data compiled from responses to Commission questionnaires.

[18] Commission interviews with domestic coke and rail industry officials.

Demand-Side Factors

U.S. foundries traditionally have consumed domestic foundry coke. In recent years, U.S. demand has increased in line with increased demand for iron castings used in trucks and sport utility vehicles. U.S. foundry coke consumption levels averaged 1.1 million metric tons during 1995-98. In 1999, however, consumption rose slightly to 1.2 million metric tons.

The U.S. coke industry generally produces a high quality coke to meet customer demand. The U.S. industry does not produce the lower quality foundry coke that is imported from China. Although all consumers can use the high quality product for all applications, some consumers can use a lower-quality coke in certain applications, such as pipe manufacture. Some of the cost savings accruing from use of the imported product, however, may be offset by the need to use higher quantities of the imported coke.

In comparison, China is the sole supplier of its foundry coke needs; there is no evidence that China imports any foundry coke. Data on demand for foundry coke in China during 1995-98 were not available, but Chinese consumption of foundry coke in 1997 was estimated to amount to no more than 1.3 to 1.4 million metric tons.

Prices

About 85 percent of the U.S.-produced foundry coke sold in the United States is sold on the basis of long-term contracts, with prices negotiated each year; about 50-55 percent of U.S. imports of Chinese foundry coke during 1999 were sold on a contract basis.[19] Contract prices are usually determined on a transaction-by-transaction basis, with discounts offered to large-volume customers; some producers publish price lists for their foundry coke. In terms of spot market sales, prices are established on the basis of competitive market factors. The weighted average unit values for domestic foundry coke sold on contract increased steadily from $175.81 per metric ton in 1995 to $185.74 per metric ton in 1998, before declining to $176.12 per metric ton in 1999; average unit values for spot sales followed a similar pattern, increasing from $182.20 per metric ton in 1995 to $191.32 per metric ton in 1998, before declining to $187.33 per metric ton in 1999. In comparison, the average unit values for U.S. imports of foundry coke from China decreased from $123.48 per metric ton in 1997 to $108.26 per metric ton in 1999.

[19] Commission interview with a domestic importer, May 2000.

Quality

Generally, U.S. producers reported that imported Chinese foundry coke can be physically used for the same applications as U.S.-produced foundry coke.[20] However, Chinese foundry coke is not substitutable for U.S.-produced foundry coke in all applications. Approximately 75 percent of the importers, brokers, and purchasers who responded to the Commission's questionnaire stated that the U.S. product is considered to be superior in terms of quality.[21] Although U.S. purchasers of Chinese foundry coke stated that quality (chemical composition and consistency) and price are considered to be the most important factors affecting purchasing decisions, they generally agreed that price was the major factor affecting their decision to purchase Chinese foundry coke.

Representatives of the Chinese industry have stated that Chinese producers have been aware of the concerns about quality held by foreign purchasers and have been working for some time to improve the quality of their coke exports. Over the years, they reportedly have worked to improve product performance, reliability of supply, transportation, and warehousing.[22] Respondents to the Commission's questionnaires suggested that Chinese and U.S. foundry cokes are generally "comparable" in terms of availability, delivery terms, delivery times, discounts offered, packaging, product consistency, and reliability of supply.

[20] Data compiled from responses to Commission questionnaires.

[21] Ibid.

[22] B. Goswami, Chinese Coke 1999 Directory, and Commission interviews with industry sources, Nov. 19, 1999, Nov. 23, 1999, and Jan. 19, 2000.

APPENDIX A
REQUEST LETTER FROM THE COMMITTEE ON WAYS AND MEANS, U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON WAYS AND MEANS

U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515-6348

August 25, 1999

The Honorable Lynn M. Bragg
Chairman
U.S. International Trade Commission
500 E Street SW
Washington, DC 20436

Dear Chairman Bragg:

Under the authority of section 332(g) of the Tariff Act of 1930, 19 U.S.C. §1332(g), I am requesting that the Commission institute a fact-finding investigation of the current competitive conditions affecting the U.S. foundry coke industry with respect to the role of imports from China in the U.S. market.

More specifically, the Commission should review the foundry coke industries in the United States and China and provide information for the most recent five-year period, to the extent possible, regarding the following:

(1) production, consumption, and trade trends;

(2) prices;

(3) significant developments in foundry coke market practices such as coke quality specifications, cost recovery, pricing policies, and by-product valuation;

(4) market factors affecting the availability of foundry coke and purchasing decisions by coke-consuming industries;

(5) costs related to compliance with environmental laws and policies;

(6) transportation costs to U.S. markets for Chinese and domestic foundry coke; and

(7) other significant factors as may be identified during the study.

The Committee would appreciate receiving the study no later than one year after receipt of this letter. Thank you for your attention to this important matter.

With best personal regards,

Bill Archer

APPENDIX B
SECOND REQUEST LETTER FROM THE COMMITTEE ON WAYS AND MEANS, U.S. HOUSE OF REPRESENTATIVES

Rec'd 5/25/00
TO: Dockets
cc: The Commiss.
OGC
Dir. of Ops

COMMITTEE ON WAYS AND MEANS

U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515-6348

May 23, 2000

332-407

00 MAY 25

The Honorable Lynn M. Bragg
Chairman
U.S. International Trade Commission
500 E Street, S.W.
Washington, D.C. 20436

Dear Chairman Bragg:

I am writing with regard to the August 25, 1999, Committee on Ways and Means' (the Committee) request for a study on foundry coke under the authority of section 332(g) of the Tariff Act of 1930 (19 U.S.C. §1332(g)). The study is assessing the effects of foundry coke imports from China on the current competitive conditions of the U.S. foundry coke market.

The Committee originally requested that the report be completed by August 25, 2000. However, due to recent developments, the Committee needs to have the study completed on an expedited basis. Therefore, I request that the completion date for that study be changed to July 7, 2000.

I appreciate your support and co-operation.

With best regards,

Bill Archer
Chairman

APPENDIX C
Federal Register Notice

advertising, the threat or effect of which is to destroy or substantially injure an industry in the United States.

(2) For the purpose of the investigation so instituted, the following are hereby named as parties upon which this notice of investigation shall be served:

(a) The complainant is: Brown & Williamson Tobacco Corp., 1500 Brown & Williamson Tower, Louisville, Kentucky 40202.

(b) The respondents are the following companies alleged to be in violation of section 337, and are the parties upon which the complaint is to be served:

Allstate Cigarette Distributers, Inc., 6795 N.W. 87th Avenue, Miami, FL 33178
Prestige Storage & Distribution, Inc., 3400 McIntosh Road, A–3, Ft. Lauderdale, FL 33316
R.E. Tobacco Sales, Inc., 782 N.W. 42nd Avenue #534, Miami, FL 33126
Dood Enterprises, Inc., 830 S. Hill Street #850, Los Angeles, CA 90014

(c) Smith R. Brittingham IV, Esq., Office of Unfair Import Investigations, U.S. International Trade Commission, 500 E Street, S.W., Room 401–M, Washington, D.C. 20436, who shall be the Commission investigative attorney, party to this investigation; and

(3) For the investigation so instituted, the Honorable Debra Morriss is designated as the presiding administrative law judge.

Responses to the complaint and the notice of investigation must be submitted by the named respondents in accordance with section 210.13 of the Commission's Rules of Practice and Procedure, 19 CFR 210.13. Pursuant to 19 CFR 201.16(d) and 210.13(a) of the Commission's Rules, such responses will be considered by the Commission if received not later than 20 days after the date of service by the Commission of the complaint and the notice of investigation. Extensions of time for submitting responses to the complaint will not be granted unless good cause therefor is shown.

Failure of a respondent to file a timely response to each allegation in the complaint and in this notice may be deemed to constitute a waiver of the right to appear and contest the allegations of the complaint and this notice, and to authorize the administrative law judge and the Commission, without further notice to the respondent, to find the facts to be as alleged in the complaint and this notice and to enter both an initial determination and a final determination containing such findings, and may result in the issuance of a limited exclusion order or a cease and desist order or both directed against such respondent.

By order of the Commission.

Issued: September 17, 1999.

Donna R. Koehnke,

Secretary.

[FR Doc. 99–24716 Filed 9–22–99; 8:45 am]

BILLING CODE 7020–02–P

INTERNATIONAL TRADE COMMISSION

[Investigation 332–407]

Foundry Coke: a Review of the Industries in the United States and China

AGENCY: United States International Trade Commission.

ACTION: Institution of investigation and scheduling of public hearing.

SUMMARY: Following receipt of a request on August 25, 1999, from the Committee on Ways and Means of the US House of Representatives (the Committee), the Commission instituted investigation No. 332–407, Foundry Coke: A Review of the Industries in the United States and China, under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)).

EFFECTIVE DATE: September 15, 1999.

As requested by the Committee, the Commission will review the foundry coke industries in the United States and China and provide information for the most recent five-year period, to the extent possible, regarding the following:

(1) Production, consumption, and trade trends;

(2) Prices;

(3) Significant developments in foundry coke market practices such as coke quality specifications, cost recovery, pricing policies, and by-product valuation;

(4) Market factors affecting the availability of foundry coke and purchasing decisions by coke-consuming industries;

(5) Costs related to compliance with environmental laws and policies;

(6) Transportation costs to U.S. markets for Chinese and domestic foundry coke; and

(7) Other significant factors as may be identified during the study.

As requested by the Committee, the Commission will transmit its report to the Committee no later than August 25, 2000.

FOR FURTHER INFORMATION CONTACT: Information may be obtained from Edmund Cappuccilli, Project Leader (202–205–3368), or Christopher Robinson, Deputy Project Leader (202–205–2334), Office of Industries, US International Trade Commission, Washington, DC, 20436. For information on the legal aspects of this investigation, contact William Gearhart of the Office of the General Counsel (202–205–3091). Hearing impaired individuals are advised that information on this matter can be obtained by contacting the TDD terminal on (202) 205–1810.

PUBLIC HEARING: A public hearing in connection with the investigation will be held at the US International Trade Commission Building, 500 E Street SW, Washington, DC, beginning at 9:30 a.m. on February 29, 2000. All persons shall have the right to appear, by counsel or in person, to present information and to be heard. Requests to appear at the public hearing should be filed with the Secretary, United States International Trade Commission, 500 E Street SW, Washington, DC 20436, no later than 5:15 p.m., February 1, 2000. Any prehearing briefs (original and 14 copies) should be filed not later than 5:15 p.m., February 15, 2000; the deadline for filing posthearing briefs or statements is 5:15 p.m., March 14, 2000. In the event that, as of the close of business on February 1, 2000, no witnesses are scheduled to appear at the hearing, the hearing will be canceled. Any person interested in attending the hearing as an observer or non-participant may call the Secretary of the Commission (202–205–1806) after February 7, 2000, to determine whether the hearing will be held.

WRITTEN SUBMISSIONS: In lieu of or in addition to participating in the hearing, interested parties are invited to submit written statements concerning the matters to be addressed by the Commission in its report on this investigation. Commercial or financial information that a submitter desires the Commission to treat as confidential must be submitted on separate sheets of paper, each clearly marked "Confidential Business Information" at the top. All submissions requesting confidential treatment must conform with the requirements of section § 201.6 of the Commission's Rules of Practice and Procedure (19 CFR 201.6). All written submissions, except for confidential business information, will be made available in the Office of the Secretary of the Commission for inspection by interested parties. To be assured of consideration by the Commission, written statements relating to the Commission's report should be submitted to the Commission at the earliest practical date and should be received no later than the close of business on March 14, 2000. All submissions should be addressed to the

Secretary, United States International Trade Commission, 500 E Street SW, Washington, DC 20436. The Commission's rules do not authorize filing submissions with the Secretary by facsimile or electronic means.

Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202-205-2000. General information concerning the Commission may also be obtained by accessing its Internet server (http://www.usitc.gov).

Issued: September 16, 1999.

By order of the Commission.

Donna R. Koehnke,

Secretary.

[FR Doc. 99-24715 Filed 9-22-99; 8:45 am]

BILLING CODE 7020-02-P

INTERNATIONAL TRADE COMMISSION

[Investigation No. 731-TA-384 (Review)]

Nitrile Rubber From Japan

Determination

On the basis of the record [1] developed in the subject five-year review, the United States International Trade Commission determines, pursuant to section 751(c) of the Tariff Act of 1930 (19 U.S.C. 1675(c)) (the Act), that revocation of the antidumping duty order on nitrile rubber from Japan would not be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time.

Background

The Commission instituted this review on April 1, 1999 (64 FR 15788, April 1, 1999) and determined on July 2, 1999 that it would conduct an expedited review (64 FR 38475, July 16, 1999).

The Commission transmitted its determination in this investigation to the Secretary of Commerce on September 10, 1999. The views of the Commission are contained in USITC Publication 3233 (September 1999), entitled Nitrile Rubber from Japan: Investigation No. 731-TA-384 (Review).

Issued: September 14, 1999.

By order of the Commission..

Donna R. Koehnke,

Secretary.

[FR Doc. 99-24714 Filed 9-22-99; 8:45 am]

BILLING CODE 7020-02-P

[1] The record is defined in sec. 207.2(f) of the Commission's Rules of Practice and Procedure (19 CFR 207.2(f))

DEPARTMENT OF JUSTICE

[AAG/A Order No. 175-99]

Privacy Act of 1974; System of Records

Pursuant to the Privacy Act of 1974 (5 U.S.C. 552a) and Office of Management and Budget Circular No. A-130, the Executive Office for United States Trustees (EOUST), U.S. Department of Justice, has reviewed its Privacy Act systems of records and identified changes that will clarify, update, and more accurately describe their systems of records.

As a result, the EOUST is reporting modifications to systems of records: JUSTICE/UST-001 Bankruptcy Case Files and Associated Records; JUSTICE/UST-002 Panel Trustee Application File: and JUSTICE/UST-004 United States Trustee Program Case Referral System.

The EOUST updated JUSTICE/UST-001 Bankruptcy Case Files and Associated Records to reflect a new systems manager, the inclusion of chapter 12 (family farmer) bankruptcy cases, a new routine use disclosure to civil or criminal law enforcement authorities, a new routine use disclosure to licensing agencies, and new records disposition information.

The EOUST updated JUSTICE/UST-002 Panel Trustee Application File to reflect a new systems manager, the inclusion of chapter 12 (family farmer) bankruptcy cases, a new routine use disclosure to courts, a new routine use disclosure to licensing agencies, and new records disposition information. The EOUST has also changed the name of JUSTICE/UST-002 Panel Trustee Application File to "Trustee File" because the system contains additional records used to determine the trustee's suitability for the initial appointment, reappointment, and removal.

The EOUST updated JUSTICE/UST-004 United States Trustee Program Case Referral System to reflect new systems managers, the inclusion of chapter 12 (family farmer) bankruptcy cases, a new routine use disclosure to licensing agencies, and new records disposition information.

Any comments may be addressed to Mary Cahill, Management and Planning Staff, Justice Management Division, Department of Justice, Washington, DC 20530 (Suite 1400, National Place Building).

Dated: September 8, 1999.

Stephen R. Colgate,

Assistant Attorney General for Administration.

JUSTICE/UST-001

SYSTEM NAME:

Bankruptcy Case Files and Associated Records.

SYSTEM LOCATION:

The Executive Office for United States Trustees (EOUST) and various offices of the United States Trustees depending upon the judicial district where a case is pending or was administered. (Field offices can be located on the Internet at http://www.usdoj.gov/ust.)

CATEGORIES OF INDIVIDUALS COVERED BY THE SYSTEM:

Individuals involved in bankruptcy proceedings (under Chapters 7, 11, 12 and 13 of 11 U.S.C.) subsequent to September 30, 1979, including but not limited to debtors, creditors, bankruptcy trustees, agents representing debtors, creditors, and trustees.

CATEGORIES OF RECORDS IN THE SYSTEM:

(a) Petitions/orders for relief, (b)schedules of assets and liabilities of debtors, (c) lists of creditors, (d) statements of debtors' financial affairs, (e) operating or status reports, (f) alphabetical cross-reference index cards, (g) general correspondence regarding cases, (h) miscellaneous investigative records, (i) copies of certain pleadings or other papers filed with the court, including those filed by the United States Trustee, (j) appraisal reports, (k) names of bank depositories and amounts of funds deposited therein, (l) names of sureties and amounts of trustees' bonds, (m) tape or other recordings of creditors meetings called pursuant to Section 341 of Title 11, U.S.C., for the purpose of examination of debtors by creditors, trustee and others, (n) plans filed under Chapter 11, 12 or 13, (o) names of persons serving as counsel, trustee, or other functionaries in bankruptcy cases, including compensation earned or sought by each.

AUTHORITY FOR MAINTENANCE OF THE SYSTEM:

These systems are established and maintained pursuant to 28 U.S.C. 586 and Title 11 U.S.C.

PURPOSE(S):

The records are used by personnel of the Executive Office and the United States Trustee field offices to determine the existence of a case, to ascertain the status of actions with respect to a case, and to ensure that timely action is taken

APPENDIX D
WITNESS LIST

As of February 14, 2000

TENTATIVE CALENDAR OF PUBLIC HEARINGS

Those listed below will appear as witnesses at the United States International Trade Commission's hearing:

Subject:	FOUNDRY COKE: A REVIEW OF THE INDUSTRIES IN THE UNITED STATES AND CHINA
Inv. No.:	332-407
Date and Time:	February 29, 2000 - 9:30 a.m.

Sessions will be held in connection with the investigation in the Main Hearing Room 101, 500 E Street, S.W., Washington, D.C.

Congressional appearance:

The Honorable Phil English, U.S. Congressman, 21st District, State of Pennsylvania

ORGANIZATION AND WITNESS	**TIME CONSTRAINTS**
PANEL 1	
Shook Trading, Incorporated, Atlanta, Georgia	20 minutes
Douglas W. Shook, Jr., President	
John Grantham, Vice President	
Koch Industries, Incorporated Koch Carbon, Incorporated, Washington, D.C.	
Patrick Kellerman, General Manager, Specialty Products	
Robert Hall, Director, Tax and International Public Affairs	

-MORE-

ORGANIZATION AND WITNESS	**TIME CONSTRAINTS**
PANEL 2	
Fenwick & West, LLP Washington, D.C. on behalf of	30 minutes

American Coke and Coal Chemicals Institute ("ACCCI")

David A. Saunders, President, ACCCI

Martin C. Dusel, Senior Vice President, Operations, Citizens Gas and Coke Utility

John M. Pearson, President, ABC Coke

Roger M. Golden--OF COUNSEL

-END-

APPENDIX E
GLOSSARY

GLOSSARY

Anthracite coal
A hard, black, lustrous coal containing a high percentage of fixed carbon and a low percentage of volatile matter.

Ash
The inorganic residue remaining after ignition of combustible substances.

Battery
Series of adjacent coke ovens, usually 45 or more ovens, sharing coal charging and by product control equipment.

Beehive oven
Refractory-lined kilns, dome-like in structure and appearance, that produce coke without recovering the volatiles produced during the carbonization process.

Bituminous coal
A coal which is high in carbonaceous matter, having between 15 and 50 percent volatile matter. Often termed "soft coal".

Byproduct or slot oven
A coke oven consisting of a series of long, narrow chambers arranged in rows, and heated by flues in which are burned a portion of the combustible gases generated by the coking of coal. All the volatile products are collected as ammonia, tar, and gas, and may be further processed into other byproducts.

Carbonization
The process of decomposing a nonvolatile carbonaceous substance, usually coal, into solid, liquid, and gaseous products, by heating in a reducing atmosphere.

Coke breeze
The fine screenings from crushed coke used predominantly as a fuel source in the process of agglomerating iron ore. Usually coke breeze will pass through a 1/4 inch screen opening.

Coke rate–
The amount of coke needed in the blast furnace to produce one ton of iron.

Cold idle
Coke ovens not producing coke or maintained at sufficient temperatures for further coke making. Ovens that can no longer produce coke without replacement of bricks

Cupola furnace
A continuous melting device that is cylindrically shaped. It is charged in alternating layers of metal (e.g., scrap iron) and the replacement fuel, usually foundry coke, which can also act as a carbon source for the melted metal.

Electric arc furnace
A device that passes a strong electric current through steel scrap, thereby melting it and allowing it to be cast into steel shapes.

Foundry coke
A type of metallurgical coke used in furnaces that produce molten iron and steel for casting purposes. Foundry coke size is generally 4 inches and larger, and requires lower temperatures and longer residence times than blast furnace coke.

Foundry industry
The industry that produces metal castings.

Hot idle
Maintaining ovens during non-coking periods at a sufficient temperature to ensure integrity of brick for future coke production

LAER
Lowest Achievable Emission Rate.

Lignite coal
Coal of low rank with a high inherent moisture and volatile matter.

MACT
Maximum Achievable Control Technology.

Mechanical oven
A term used in China to denote a cokemaking process dependent on machinery and automated equipment for coal charging, coke pushing, quenching, and other steps in production. This technology is usually associated with slot ovens, with increased fixed costs and less manual labor.

Metallurgical coke
A coke with very high compressive strength at elevated temperatures, used in metallurgical furnaces, not only as a fuel, but also to support the weight of the charge. In China, this term refers to only blast furnace coke, not foundry coke.

Nonmechanical oven
A term used in China to denote a cokemaking process dependent on manual labor and used in beehive and modified beehive oven production of coke, where ovens are filled with coal and emptied of coke by hand. There are no non-mechanical ovens in operation in the United States today.

Offtak
Gas collecting system located on the roof at one end of coke oven designed to carry off the volatile products liberated in the coking process.

Oven
Individual coking chamber composed of silica brick walls with dimensions ranging from 4 to 14 feet in height, 30 to 45 feet in length, and 1 to 2 feet in average width.

Primitive oven
The term used in China to denote a non–mechanical, non-recovery oven using pits dug out of the earth or the side of a hill and filled with coal for coking. Primitive ovens are essentially the same as beehive ovens.

Tuyere
A tube or opening in a metallurgical furnace through which air is blown as part of the extraction or refining process.

Volatile matter–
Those products, excluding moisture, liberated in the form of gas and vapor during the coking process.