



PACE
PETROLEUM
COKE
QUARTERLY

**Monthly/Quarterly Reviews/
Special Topics**

Petroleum Coke Services

“Petroleum Coke Quarterly”



Established in 1983, the **Pace Petroleum Coke Quarterly** is recognized as the authoritative source of objective analyses for the petroleum coke industry. The continuing service is widely used to support marketing, purchasing, and strategic decisions by domestic and international producers, marketers, traders, and end users of both green and calcined coke. Clients of the service control 75% of world calcining capacity, 65% of world refinery coking capacity, and 70% of the world's aluminum capacity. Outlined below are the basic features of the service.

Quarterly Reports—Reports are issued mid-quarter and focus on the following basic market components:

- **Energy Outlook**—Jacobs Consultancy's statistical review of the refining sector
- **Production**—Includes a survey of each United States and European petroleum coke producer
- **Markets**—Developments impacting the marketplace
- **Prices:**
 - Fuel-Grade—FOB U.S. Gulf and West Coasts
 - Calcifiable-Grade
 - Calcined Anode-Grade—FOB U.S. Gulf and West Coasts and CIF Northwest Europe
- **Inventories**—At refineries and awaiting export from the U.S. Gulf and West Coasts
- **Imports & Exports**—U.S. receipts of fuel-grade and calcifiable grade petroleum cokes, and U.S. shipments of green, calcined, and premium coke
- **Transportation**—Prevailing rates for inland United States and ocean vessels.

An international perspective is given to the reports for all types of petroleum coke (green and calcined: regular and premium grade).

Supplements—To add continuity to the analytically-oriented quarterly publications, monthly supplements are issued. These reports review prevailing prices, production, and U.S. exports as well as provide market intelligence.

Special Topics—Our objective is to provide timely insight on complex issues using in-house analysis and industry contacts. Topics discussed in the past include: *Delayed Coker Shutdown Analysis*; *Gulf Coast Calcined Coke Export Market Share*; *Preparation of Petroleum Coke Fuel*; *Calcined Petroleum Coke Pricing and Manufacturing Economics*; *Calcined Petroleum Coke in Western Europe the Titanium Dioxide Industries*; *Petroleum Coke Uses in the Steel Industry*; and *Calcined Petroleum Coke Update*.

Types of Petroleum Coke Analyses

World Petroleum Coke Marketing Analyses

Jacobs Consultancy has undertaken several studies concerning worldwide green and calcined petroleum coke markets. Particular areas of emphasis for various studies have included Western Europe, Eastern Europe, North Africa, Scandinavia, and the Middle East.

Specific objectives of these studies were as follows:

- Marketability of expanded petroleum coke production
- Contract marketing considerations
- Calcined coke production
- Needle coke production.

These reports were generally segmented by product (green, calcined regular, and needle coke) to provide a worldwide view of the supply and demand for each product. In-depth discussions for the United States and Europe were also included for each product. Detailed supply/demand balances, quality trends, economics, and pricing forecasts were developed.

These studies were conducted using a number of resources including extensive worldwide industry field contacts, as well as Jacobs Consultancy's in-house information accumulated over 30 years of consulting to the worldwide refining and petrochemical industries.

Region-Specific Petroleum Coke Marketing Analyses

Jacobs Consultancy has conducted approximately 25 region-specific coke studies. Major projects have focused on Western Europe, the Middle East, and the United States Gulf and West Coasts. These studies contained in-depth discussions of the following issues:

- Supply/demand and pricing (historical and forecasted) for all petroleum coke grades
- Import/export market outlook and trends
- Distribution channels
- Competition (production and distribution)
- World economic factors affecting demand and supply of varying petroleum coke grades
- Economics and pricing of petroleum coke processes.

Strategic Studies

Jacobs Consultancy has completed numerous studies addressing issues raised by companies in the power, paper, aluminum, chemical, calcining, refining, trading, and terminalling industries. Jacobs Consultancy has investigated petroleum coke for industry research organizations, independent power developers, utilities, and equipment suppliers. Such studies have contained analyses of: usage of petroleum coke in power plants, cogeneration, and coproduction (gasification to steam, power and industrial gases) facilities; future availability and pricing; operational, maintenance, and environmental issues; logistic costs; pricing mechanisms for various market segments, and

development of petroleum coke purchasing strategies. Representative projects are described below:

Calcining Industry—A unique coke blending model was developed for a U.S. calciner to optimize the blend of green petroleum coke for feedstock. Data concerning coke prices, quality, and availability and transportation costs were processed using linear programming techniques to determine the most economic calciner feed blend. For one client, Jacobs Consultancy developed prices for calcined coke and coal tar pitch; in another assignment, we provided quarterly estimates for prices of calcined petroleum coke consumed as recarburizer.

Calcined petroleum coke production costs and market economics have been prepared for a major international terminalling company and several calciners. Comparisons were drawn between existing and new facilities in the United States. The analyses thoroughly considered the viability of cogeneration facilities associated with petroleum coke calciners. Competitive assessments of regional calcined coke producers were prepared to anticipate future trends within the industry.

We advised the developer and worked with lenders during the early stages of a **Middle East calciner project** in the areas of green coke testing, site selection, environmental considerations, and the requirements for financing the project.

We worked with a local consultant and our parent company office in Kuala Lumpur to study the restart of the idled **Pertamina petroleum coke calciner**.

Refining Industry—Jacobs Consultancy has performed studies for petroleum coke producers evaluating various strategies for marketing their petroleum coke. These studies have focused on costs to market petroleum coke through the entire value chain. The impacts of changing petroleum coke quality, logistics, and marketing tactics were evaluated.

Aluminum Industry—In a number of studies Jacobs Consultancy has assessed the outlook for anode-grade petroleum coke demand, supply, and pricing. Several clients were particularly interested in the U.S. Gulf Coast, Mid-Continent, and West Coast refineries and the effects that changing crude oil qualities would likely have on the manufacturing cost, quality, and availability of petroleum coke. Several studies required a survey of appropriate refiners in each area to identify possible new or existing sources of coke. Jacobs Consultancy has also assessed the probability of announced aluminum smelter projects reaching completion and the resultant impact on anode-grade petroleum coke demand based on the additional capacity.

Key areas such as sweet/sour crude slates were dealt with in detail so that their effect on coker operations could be clearly shown. Analyses of price-setting mechanisms such as desulfurization were performed so that trends in economics and overall operating modes would appear in perspective.

Paper Industry—Jacobs Consultancy was requested by a major paper manufacturer to provide a study of U.S. petroleum coke markets to be used as part of an overall evaluation of the feasibility of using petroleum coke as fuel in paper mills. Price forecasts, logistical factors, and potential supply arrangements were included in the study.

Chemical Industry—At the request of a major chemical company, Jacobs Consultancy completed an assessment of the possibility of using petroleum coke as feedstock for producing ammonia. In addition to supply/demand balances and coke price forecasts, an economic analysis was performed to compare producing ammonia from natural gas and gasification of petroleum coke. Jacobs Consultancy was the lender's independent engineer, evaluating the technical and commercial aspects of a petroleum coke-to-chemicals gasification project.

Calcined coke markets were examined for another international chemical company to assess the product's price and availability in the production of carbon-based gases. Purchasing strategies were included in the study.

Market Entry—Jacobs Consultancy has completed several confidential market surveys to evaluate potential new uses of prepared petroleum coke-based fuels or blends, such as pitch/coke. Sources in several energy-intensive industries were contacted for information used to estimate potential market size. Available and emerging combustion technologies were reviewed. Pricing strategies were also developed based on preparation costs and competing fuel prices.

Litigation & Mediation Support

We have been called on to provide expert opinions and support in a number of court cases and mediations. In one such engagement, we were retained to appear before the pollution control board of a western state. Support was provided regarding sulfur dioxide emissions from an aluminum anode manufacturing plant using calcined petroleum coke as a feedstock. Jacobs Consultancy has also provided interpretations of the petroleum coke industry to the Federal Trade Commission. In another project, Jacobs Consultancy was retained to determine the fair market value of a dry bulk facility whose primary profit source was petroleum coke.

Production Economics

At the request of several clients (including refiners, resellers, financial firms, and calciners), Jacobs Consultancy has examined the economics of petroleum coke production and coke calcining at various worldwide locations. Desirability of producing coke at the various refining locations was determined in a stepwise fashion. For example: the costs to produce regular and premium grade petroleum coke products were developed by comparison with the most profitable refinery operation that excludes coking. Relative economics were then determined for regular versus premium grade coking operations. Further sensitivities were performed for several clients to meet their specific feedstock/product requirements.

Refinery processing schemes were analyzed in each study. Material balances and processing unit capacity utilizations as well as refinery product composition and quality were reviewed in detail to determine their impact on coking operations.

To evaluate the specific economics of various types of coke production, manufacturing costs were determined, and realizable coke product prices were forecast.

Calciner Operations Forecasting

Jacobs Consultancy has been retained by several major petroleum coke calciners to evaluate the clients' position in the calcining industry. Topics addressed in these analyses included:

- Background discussion of petroleum refining, coking, and the production of calcined petroleum coke
- Discussion of the calcining business in general and a forecast of key industry variables
- Evaluation of the clients' competitive position in the industry with regard to feedstock supply, facility profitability, and product contracts
- Determination of revenue and operating cash margin under several scenarios.

Industry & Client Presentations

Jacobs Consultancy has given numerous presentations concerning both fuel-grade and calcined petroleum coke. Presentations are made both in conjunction with client studies or on a stand-alone basis. Recent presentations have been made at an international coal conference, a U.S. coal conference and several private industry meetings.

Industry Publications and Services

Petcokes.com Service

In addition to our flagship publication **Petroleum Coke Quarterly**, we offer a wide variety of other studies and services to clients involved in the petroleum coke or associated products industries. These services are described in the following paragraphs.

Jacobs Consultancy's **Petcokes.com** news service via e-mail is available to all of our *Petroleum Coke Quarterly* subscribers. We send e-mail messages of news releases pertaining to the petroleum coke industry to keep our clients informed as events happen. We realize that in today's business environment it is advantageous to have quick access to information, leading to a competitive edge in this rapidly changing industry. We also offer archived reports and news via our website **Petcokes.com**.

The e-mail services offers two topics on which a subscriber may choose to focus:

- Fuel-Grade Petroleum Coke—The largest consuming sector in volume in the petroleum coke industry is the one that utilizes fuel-grade petroleum coke. More than two-thirds of all petroleum coke produced in the world is mainly consumed in the cement industry, power generation sector, and the steel industry. We focus on events occurring in these market segments.
- Calcined Petroleum Coke—The other side of the industry lies mainly within the anode-grade petroleum coke business, as all of this material is destined to the primary aluminum industry. Major events occurring in the aluminum sector, TiO₂ industry, and needle coke business are tracked by this service.

Calcined Petroleum Coke Report (Annual)

To address issues facing the calcined petroleum coke industry, our **Calcined Petroleum Coke Report** is published in the fourth quarter of each year and focuses on a detailed outlook for the calcined coke industry for the next three years. It provides and discusses information from Jacobs Consultancy's historical data base about the industry and its related sectors. Clients of this annual report receive Jacobs Consultancy's latest analysis and conclusions on the calcined coke business and the outlook for the forthcoming three-year period.

The important issues pertaining to the availability of anode-grade green petroleum coke are a key component of the report. The study includes discussions on the change in supply of existing calciner feedstocks, as well as potential new sources of green coke that will directly affect world calcining operations, calcined coke quality and availability.

Our review of new calcining projects, which will come into operation during the next few years offers an insight into future calcined coke availability for the aluminum industry and whether quantity and quality

**Calcined Petroleum
Coke:
The Next 10 Years**

requirements can be met. The report reviews the planned projects, the likelihood of implementation, and the possible scenarios that will arise if these projects are completed. Key issues discussed in the report include:

- Supply/Demand Outlook for Calcined Coke
- Anode-Grade Green Coke Availability
- Anticipated New Calciner Projects
- Primary Aluminum Production Growth
- Aluminum Smelting Technology Update

This timely study is aimed primarily at the aluminum industry, although titanium dioxide producers, recarburizer users, and graphite electrode producers will also find it a useful strategic planning tool. The study provides insights into the global and regional refining issues, which affect calcined coke supply and quality, and how changes in these variables affect calcined coke quality. The study is organized as follows:

Petroleum Coke Supply and Quality—analyzes green coke quality by region and identifies planned coker expansions/grass roots projects.

Calcifiable Green Coke Supply/Demand Balance—Analyzes supplies from current sources and new cokers, and discusses out-of-spec and marginally acceptable coke for calcining.

U.S. Gulf Coast Calciner Green Coke Supply Shortage—discusses the region's shift to fuel-grade petroleum coke production and analyzes the impact on calciner economics and reinvestment potential.

Calcined Petroleum Coke Demand—discusses the world aluminum industry (production, markets, smelting technology advances) and the relationships to anode demand; quantifies other demand for calcined coke (titanium dioxide industry, electric arc steel market, and carbon raising in the iron industry).

Capacity and Economics of Calcining—provides details on calcined coke supply and quality in major world regions, new or shutdown calcining ventures, and presents representative economics including operating costs, waste heat recovery systems, and calciner margins.

Included in the report is an overview of the environmental situation with respect to carbon plant operations. Current market intelligence and an evaluation of future competitive trends are also part of the study. A range of scenarios for the supply/demand balances is included. Of particular note is the inclusion of heretofore unavailable data on the former CPE countries, especially centering on the Russian aluminum industry and markets.

**Annual
Petcoke
Conference**

**Outlook for
High-Sulfur
Petroleum Coke—
2002, A Global
Market in Change**

As part of our continuing efforts to provide valuable information to our clients and select market participants, we conduct an annual non-affiliated petroleum coke conference. At this two-day gathering, we bring together the industry's leading experts in the anode-grade and fuel-grade petroleum coke markets.

The conference enables participants to freely exchange views on technically-oriented matters. Sessions have focused on the following issues: availability and quality of green and calcined petroleum coke; factors affecting future petcoke production; fuel-grade applications; refinery trends, cement, and power industry opportunities for petcoke usage; and world economic trends.

The fuel-grade petroleum coke industry has experienced a remarkable period of increased supply. From a market that grew at 4.3% annually from 1990-1998, petroleum coke output expanded from 1999-2002 at a rate of 8.2% per year. Production in 2002 is expected to increase past 58 million dry metric tons (DMT), and by 2010, surpassing 96 million DMT.

There are various reasons for this expansion in coker capacity. Recently, alternative refining dynamics have spurred most of the new coke output. Crude supply agreements, which stabilize coking project economics, have been a key component of many new coker projects. The most notable change has been the boom in projects that produce synthetic crude oil from bitumen/tar sands using coker-based upgrading facilities.

Historically, the use of petroleum coke in fuel applications has eventually matched output. However, the petroleum coke industry now faces questions regarding the future demand sectors for the increased production. Power generation is often the targeted application to absorb much of the new petroleum coke supply. Presently, however, there are uncertainties with numerous related issues including new environmental regulations and project timing.

Jacobs Consultancy's 2002 multi-client study **Outlook for High-Sulfur Petroleum Coke** addressed these issues from several perspectives. We provided a complete picture of petroleum coke supply, including forecasts of crude oil runs, which determine coke quality, as well as outlooks for future coker projects/expansions. Fuel-grade petroleum coke demand was examined in detail for the world's major consuming regions and then further refined into the primary consumption sectors: cement and lime kilns, power generation, and steelmaking. We also determined the ability of each sector to absorb additional quantities of petroleum coke in the future. Regional environmental regulations as they impact petroleum coke were also discussed in detail.

Topics included:

- What is the latest outlook for global/regional transportation (gasoline, diesel, and jet) fuels requirements and the resulting impact on refinery and delayed coker operations? Based on the

Coal Tar Pitch Report

requirements to produce cleaner transportation fuels in the United States, what will be the impact on smaller, independent refineries with cokers?

- What impact will new, high-quality Venezuelan and low-quality Mexican Maya-based cokers have on petroleum coke supplies and markets? Will “better” quality petroleum cokes continue to achieve their historic price premium to high sulfur petroleum cokes?
- What is driving the Canadian coker construction boom, and how will it affect petroleum coke markets?
- Will changes in high sulfur petroleum coke quality reduce its value in cement manufacture? What will be the impact on petroleum coke demand for this industry?
- The boom in new solid fuel power plant development—will it last?
- What are petroleum coke’s advantages/disadvantages for power generation using traditional boilers, CFBs and gasifiers?
- How will the Kyoto Protocol affect consumption of petroleum coke and other solid fuels?
- What is New Source Review (NSR) and how does it impact petroleum coke supply and US petroleum coke markets? Why is the NSR issue markedly different for the power industry compared to the refining and cement industries?

Following the widespread reception of the 1995 single-issue study, ***The Outlook for Coal Tar Pitch***, Jacobs Consultancy expanded its coverage of coal tar pitch into a continuing report, issued in April and October of each year. In each issue, Jacobs Consultancy addresses the questions and issues surrounding coal tar pitch:

- Price
- Supply/Demand
- Transportation
- Environmental Changes
- Technology Changes

The report provides on-going evaluation and acts as a strategy tool for consumers of coal tar and coal tar pitch products. In addition to updating the prices for coal tar and coal tar pitch in the major producing/consuming regions, this publication discusses developments in the related industries of aluminum and crude steel. Highlights from recent issues include:

- Detailed coal tar and coal tar pitch trade statistics from major producing and consuming countries
- Examination of the consolidation of U.S. pitch production in view of anticipated higher aluminum output
- In-depth review of the processes, applications, markets, and prices for coproducts of coal tar distillation
- Update of environmental issues facing coal tar pitch distillation.

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First Quarter 2009

In This Issue

Section			
A	Summary	<u>1</u>	
B	Energy Outlook	<u>6</u>	
	Crude Oil Prices/Refining Margins	6	
	Coking Economic Indicators	7	
C	Supply	<u>9</u>	
	Green Petroleum Coke Production	9	
	United States and Aruba		
	Imports of Green Petroleum Coke	20	
	Green Petroleum Coke Production—Europe	20	
D	Markets	<u>21</u>	
	Aluminum Fundamentals	21	
E	Prices	<u>21</u>	
	High Sulfur Fuel-Grade Petroleum Coke	21	
	U.S. Gulf/Caribbean		
	Low-Sulfur Fuel-Grade Petroleum Coke	27	
	U.S. West Coast		
	Calcined Petroleum Coke	30	
	Price Commentary	34	
	Anode-Grade Green Petroleum Coke	34	
	Representative Anode Quality Blend		
	Calcined Industry Operating Statistics	36	
F	Exports	<u>39</u>	
	Green Petroleum Coke	39	
	Calcined Petroleum Coke	47	
	Premium/Miscellaneous Petroleum Coke	55	
G	Inventories and Transportation	<u>60</u>	
	Inventories for Export at Operating Terminals	60	
	Inventories for Export at Refineries	60	
	Export Versus Production	62	
	Transportation	62	
	Appendix	<u>66</u>	

Tables

Section C

C-1	U.S. Green Coke Production (Sorted by Company)	<u>11</u>
C-2	U.S. Green Coke Production (Sorted by Sulfur)	<u>12</u>
C-3	U.S. Imports of Green Petroleum Coke	<u>16</u>
C-4	European Green Petroleum Coke Production (Sorted by Company)	<u>19</u>
C-5	European Green Petroleum Coke Production (Sorted by Sulfur)	<u>19</u>

Section D

D-1	Primary Aluminum Production	<u>22</u>
D-2	Primary Aluminum Inventory and LME Spot Price	<u>23</u>

Section E

E-1	Green/Calcined Petroleum Coke Prices	<u>26</u>
E-2	Representative Green Coke Blend For Gulf Coast Calciner	<u>34</u>

Section F

F-1	Summary of U.S. Green Petroleum Coke Exports	<u>40</u>
F-2	Summary of U.S. Calcined Petroleum Coke Exports	<u>49</u>
F-3	Summary of U.S. Premium/Miscellaneous Petroleum Coke Exports	<u>56</u>

Figures

Section B

B-1	Coking Incentive/Coker Contribution	<u>8</u>
B-2	Northwest Europe Coking Incentive	<u>10</u>

Section C

C-1	PADD Map	<u>13</u>
C-2	Green Petroleum Coke Production	<u>14</u>

Section D

D-1	Quarterly Primary Aluminum Production	<u>22</u>
D-2	Primary Aluminum Price vs. Inventory	<u>23</u>

Section E

E-1	Residual Fuel Oil/Coal/Coke Prices	<u>28</u>
E-2	Mediterranean Solid Fuel Market	<u>29</u>
E-3	Japanese Solid Fuels Market	<u>31</u>
E-4	Calcinable Green Petroleum Coke (Category)	<u>32</u>

Section F

F-1	Top 10 Export Destinations (Green)	<u>46</u>
F-2	U.S. Green/Calcined Petcoke Export Volumes	<u>48</u>
F-3	Top 10 Export Destinations (Calcined)	<u>54</u>

Section G

G-1	Green Coke Inventory at Refineries	<u>61</u>
G-2	Green Coke Quarterly Exports vs Production	<u>63</u>

Pace Petroleum Coke Quarterly

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Petroleum Coke Quarterly


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Management Synopsis	1	Aluminum Market Fundamentals	48
Refining Economics	12	Aluminum and Calcined Coke Market News	53
Economic Indicators	12	World	53
WTI-Maya Spread	13	North America	54
Coker Contribution	14	Latin America	55
Fuel-Grade Petroleum Coke Prices	16	Other Asia	55
High Sulfur Fuel-Grade (USGC/Caribbean)	16	Middle East and Africa	55
Low Sulfur Fuel-Grade (USWC)	18	China	55
Fuel-Grade Petcoke Supply-North America	20	Transportation	56
Fuel-Grade Petcoke Supply-Asia	20	USDA Barge Grain Index	56
Fuel-Grade Petcoke Demand-North America	20	Coal/Petroleum Coke Barge Rates	56
Fuel-Grade Petcoke Demand-Asia	23	Ocean Freight	58
Natural Gas	23	U.S. Petroleum Coke Trade	61
Coal	24	Imports—Fuel-Grade Green Coke	61
North America	24	Imports—Calcinable Green Coke	62
Asia	26	Exports	63
Europe	28	Green Petroleum Coke	63
Latin America	29	Historical Trends	69
World Steel	29	Calcined Petroleum Coke	69
Environment	33	Premium/Miscellaneous Coke	74
In-Depth Focus	38	Appendix	82
Calcined Petroleum Coke Markets	45		
Anode-Grade Coke Price Commentary	45		

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