THE MINERAL INDUSTRY OF

SAUDI ARABIA

By Bernadette Michalski

In 1997, the Kingdom of Saudi Arabia, the world's largest producer of crude oil, accounted for 13% of the total world output. In recent years, the Kingdom has achieved a significant diversity in its mineral industry through the development of gold mining operations and value-added cement, fertilizer, petrochemical, and steel manufacturing facilities. Awaiting exploitation are the Az Zabirah bauxite, the Wadi Sawawin iron ore, the Al Jalamid phosphate, the Jabal Sayid copper, and the Khnaiguiyah zinc-copper deposits, which are expected to add to this diversity and, consequently, to reduce reliance on petroleum earnings. The bulk of revenues and export earnings, however, continue to be generated by the hydrocarbon industries, including downstream refining and petrochemicals. Petroleum accounted for 70%, or $41.5 billion[1], of Government revenues and 38% of the gross domestic product (GDP) in 1997 compared with 35% in 1994. The nonoil industries accounted for 8% of the GDP (Arab Petroleum Research Center, 1998, p. 403).

Government Policies and Programs

The Deputy Ministry for Mineral Resources (DMMR) has enlisted the cooperation of the U.S. Geological Survey (USGS) and the Bureau de Recherches Géologiques et Minières of France in the mineral exploration and assessment of the mineral resources of the country. The results of more than 30 years of exploration have been made available in open-file reports, technical reports, bulletins, annual reports, and geoscience maps available through the USGS.

The Government has focused on development of the Kingdom's resources of bauxite, copper, gold, iron ore, phosphate rock and zinc. The Government encouraged private interests to participate in the Kingdom's economic development by offering low-interest or interest-free loans to qualified companies.

The state-owned Saudi Arabian Mining Co. (Ma'aden), capitalized at more than $1 billion, was created in April 1997. The company is to spearhead exploration and mining activities in Saudi Arabia on a commercial and profitable basis. It is also mandated to promote the development of downstream production facilities. The privatization of Ma'aden within 6 years is under consideration. The company is to study and propose possible changes in mining legislation that would encourage further private investment. One of the basic challenges is to provide infrastructure in the remote areas where most mineral deposits are located. One consideration is the development of a national railroad network connecting Dammam with Al Jubayl and Jiddah with Dammam. An integrated mining and transportation policy is expected in the near future.

Environmental Issues

Saudi Arabia created a ministerial committee to set standards, such as emission controls, and procedures, such as monitoring air and water pollution, for environmental protection. The committee drew its membership from the 12 ministries. Each ministry carried out its own environmental audit under the guidance of the Central Department on the Environment and the Department of Meteorological Observation and Environment.

Production

In 1997, the average production of crude oil, including the Saudi Arabian share of production from the Partitioned Zone shared with Kuwait, was 8.56 million barrels per day (Mbbl/d). Although actual production capacity is 10 Mbbl/d, output has been averaging more than 8 Mbbl/d in recent years in accordance with the quota assigned by the Organization of Petroleum Exporting Countries (OPEC). Saudi Arabia also produces cement and other industrial and construction materials including ornamental stone. In the metals group, copper, gold and by-product silver, and zinc are produced. Steel is produced from scrap and imported iron ore pellets. *(See table 1.)*

Trade

Of the total exports in 1997, valued at $54.3 billion, crude oil and petroleum products accounted for 87%, valued at $47.3 billion. Crude oil exports averaged 6.3 Mbbl/d, and petroleum product exports averaged 850,000 barrels per day (bbl/d). During 1997, Europe imported more than 1.9 Mbbl/d of crude oil and petroleum products, and Japan imported more than 1.4 Mbbl/d. Imports of Saudi Arabian crude oil and products by the United States totaled nearly 1.4 Mbbl/d including 111,000 bbl/d of petroleum products, mostly unfinished oils and motor gasoline. Saudi Arabia remained the leading supplier to the United States, accounting for 14% of U.S. petroleum imports in 1997 (Energy Information Administration, 1998, p. 82).

The value of nonoil exports increased rapidly during the past decade. In 1997, they were valued at $7 billion compared with about $1 billion in 1983. This trend was expected to continue as more industries come on-stream and existing facilities are expanded.

The Kingdom's total imports were valued at about $25 billion in 1997. The United States remained the largest supplier to the

[1]Where necessary, values have been converted from Saudi riyals (Srls) to U.S. dollars at the rate of Srls3.7450=US$1.00.

Kingdom and accounted for nearly one quarter of Saudi Arabia's imports.

Most imports were subject to customs duties at rates ranging from 12% to 20%. Imports from members of the Gulf Cooperation Council (GCC) were exempted, provided that at least 40% of the value added was effected in GCC countries and at least 51% of the capital of the producing firm was owned by citizens of GCC-member countries.

Monetary authorities and all other residents, including private persons, could freely and without license purchase, hold, and sell gold in any form, at home or abroad. They could without license and without payment of any customs duty or tax trade gold in any form, with the exception of gold of 14 carats or less, the import of which was prohibited.

Structure of the Mineral Industry

All minerals, including vast petroleum and natural gas reserves, were owned by the Government. Exploitation was predominantly controlled by Government organizations. *(See table 2.)* The Government-owned Saudi Aramco was the only company authorized to engage in oil and gas exploration and development within Saudi Arabia. Many industrial projects, however, were joint ventures between Saudi firms and foreign partners. At the close of 1997, there were 1,352 such joint ventures. Most of these were involved in petrochemical, petroleum refining, electrical engineering, and electronics activities; the capital investment totaled nearly $35 billion, about 60% of which was Saudi capital (Arab Petroleum Research Center, 1998, p. 397).

Commodity Review

Metals

Aluminum.—A 1-million-metric-ton-per-year (Mt/yr) alumina plant has been approved for construction at the Al Jubayl Industrial Estate by the Government of Saudi Arabia. The $1 billion project is scheduled to be completed within 5 years. Imported and domestic bauxite probably will be used as feedstock; the alumina probably will be exported to the United Arab Emirates for the Dubai Aluminium Co. (Metal Bulletin, 1997).

Bauxite.—The DMMR continued plans for exploitation of the Az Zabirah bauxite deposit about 470 kilometers (km) northwest of Riyadh and 615 km from the proposed alumina plant site. The deposit was part of a Cretaceous paleolaterite that outcropped in three main zones covering a distance of 105 km. The DMMR reported that minable reserves were 102 million metric tons (Mt) of essentially aluminum monohydrate ores averaging 57.5% aluminum oxide, 8% ferric oxide, and 5.5% silicon dioxide.

Copper.—The Alujain Corp. of Saudi Arabia has placed a hold on its plans to develop a large copper deposit at Jabal Sayid in the Arabian Shield about 340 km northeast of Jiddah. The deposit was defined at 80 Mt grading 1.5% copper. The proposed 150,000 metric-ton-per-year (t/yr) copper smelter at Madinat Yanbu Al Sinalyah on the Red Sea coast was also put on hold.

Ferroalloys.—The Gulf Ferroalloys Co., owned by GCC investors, brought a ferroalloy complex on-stream in mid-1996 at Al Jubayl, a location accessible to high-purity quartz and inexpensive energy. The complex had a capacity of 105,000 t/yr of ferrosilicon, ferromanganese, silicomanganese, and silicon. The ferrosilicon production was expected to be exported because domestic needs did not exceed 3,000 t/yr. Ferromanganese, silicomanganese, and silicon metal production was intended for local consumption, principally the steel and aluminum industries in the region.

Gold.—Gold recovery continued at the high-grade Mahd Adh Dhahab underground mine, 270 km northeast of Jiddah, and at the Sukhaybirat open-pit mine, about 480 km northwest of Riyadh. A third deposit, Al-Amar, 220 km southwest of Riyadh, was being developed for underground mining.

In 1997, Mahd Adh Dhabab processed nearly 200,000 metric tons (t) of ore averaging 24.41 grams per ton (g/t) gold and 131.24 g/t silver. Gold production, including more than 0.5 t recovered from heap leaching, was nearly 4.32 t as bullion and more than 1.0 t in concentrate for a total of 5.32 t compared with 4.88 t in 1996.

The Saudi Company for Precious Metals, Ltd. (SCPM) operated the Sukhaybirat East Mine producing more than 1.47 t gold by carbon in leach from 650,000 t of ore grading 2.5 g/t gold and more than 0.46 t gold by heap leaching 606,000 t at 0.89 g/t gold for a total of 1.94 t gold compared with 2.65 t in 1996. Reduced output from Sukhaybirat was attributed to difficulties at the crusher plant which restricted mill throughput. The lower throughput was partly offset by higher gold grades. Gold output of the Kingdom was expected to double by 2000 (Northern Miner, 1997).

The Dhahab Co. Ltd., a Saudi Arabian-French joint venture, operated a 110-t/yr-capacity gold refinery at Jiddah using scrap gold jewelry and domestic and imported bullion.

Iron and Steel.—The Saudi Iron and Steel Co. (Hadeed) was undergoing the third stage of its expansion program, which includes the installation of an 850,000 t/yr capacity flat steel rolling mill. The plant is scheduled for completion in 1999 and will increase Hadeed's total production capacity of a variety of semimanufactured steel products to 3.55 Mt/yr. Feedstock for the plant will be obtained from a fourth direct reduction unit now under construction and is scheduled to come on-stream in 1999.

Silver.—Mahd Adh Dhabab Mine produces silver as a byproduct of gold recovery. In 1997, nearly 200,000 t ore averaging 131.24 g/t silver was processed yielding 3.65 t silver in bullion and 13.25 t in concentrate. About 0.31 t silver was recovered by heap leaching old mine tailings at Mahd Adh Dhabab.

Zinc.—The Arabian Shield Development Co. of Dallas, Texas, in partnership with the Al Mashreq Company for Mining Investments have formed a joint venture, Arabian Shield Company for Mining Industries (Arabian) to mine and process Al Masane polymetallic ores. The Al Masane deposit, in southwestern Saudi Arabia, contains demonstrated reserves of 7.2

Mt averaging 5.33% zinc, 1.44% copper, 1.2 g/t gold, and 43 g/t silver. Output was anticipated to be 58,000 t/yr of zinc concentrates containing 54% zinc, 34,900 t/yr of copper concentrates containing 25% copper, and 22,000 ounces of gold and 800,000 ounces of silver from the copper concentrate and the doré bullion, which is to be produced from the cyanidation plant to be built at the mine site. Financing for the $89-million project was formalized by the December 1997 approval of a $38-million interest-free loan from the Saudi Industrial Development Fund. Arabian will provide $26 million, and the remaining $25 million is to be obtained from commercial banks in Saudi Arabia and the Gulf area (Middle East Economic Digest, 1998a). Mine products will be delivered to custom smelter and refineries outside Saudi Arabia (Metal Bulletin, 1998).

Industrial Minerals

Cement.—The Southern Province Cement Co. commissioned a second plant in mid-1997. Located southwest, about 65 km south of Bishah, the plant's cement capacity will be 1.3 Mt/yr and will include a 40-megawatt (MW) power station.

Cement producers reduced output by 6%, to 15.4 Mt as capacity surpassed demand in 1997. Local deliveries were 14 Mt. Of the remainder, 1.3 Mt was exported principally by Saudi Cement Company (Middle East Economic Digest, 1998b).

Fertilizers.—The Kingdom's fertilizer producers were in a position to become dominant suppliers of nitrogen fertilizers in the international market. In 1997, the Saudi Arabian Fertilizer Co. (SAFCO) entered into a construction contract for a second plant at Al Jubayl. The plant, to be operational in 2000, will raise Safco's urea production capacity to 1.5 Mt/yr and ammonia capacity to 1.2 Mt/yr. The National Chemical Fertilizer Co. (Ibn Al Baytar) was constructing facilities for the production of 887,000 t/yr of sulfuric acid, 265,000 t/yr of phosphoric acid, and 16,400 t/yr of aluminum fluoride. The new units are scheduled to enter production in 2000. Phosphoric acid requirements were imported from Morocco. In May 1997, the Al Jubayl Fertilizer Co. (SAMAD) announced the construction of a phthalic anhydride plant to come on-stream in the last quarter of 1999 (Arab Petroleum Research Center, 1998, p. 389).

Phosphate.—The phosphate rock deposit in Al Jalamid, about 120 km from Turayf, near the Jordanian border, has proven reserves of 213 Mt of ore averaging 21% diphosphorus pentoxide. The deposit is to be developed by Ma'aden and a consortium of private companies. The beneficiation process was expected to produce 4.5 Mt/yr of phosphate concentrate that will be transported 1,200 km to Al Jubayl where it will be the feedstock for 2.9-Mt/yr diammonium phosphate plant (Fertilizer Week, 1997).

Mineral Fuels

Natural Gas.—Most of Saudi Arabia's known natural gas reserves occur as associated gas; Saudi Aramco has, however, focused exploration on the periphery of the giant Ghawar Field in the hope of discovering gas-bearing structures beneath the oil reservoir. In 1997, accumulations of nonassociated gas were discovered at Al Tayinat, 45 km southeast of Ghawar, and at Al Wafra, 30 km southwest of Ghawar. These discoveries added 2 billion cubic meters to the Kingdom's nonassociated natural gas reserves now totaling nearly 2 trillion cubic meters (Arab Petroleum Research Center, 1998, p. 373).

The Kingdom's Master Gas System (MGS) had the capacity to transport 164 million cubic meters per day (Mm^3/d) of natural gas; the processing plants at Berri, Shedgum, and Uthmaniya, however, had a processing capacity of only 113 Mm^3/d. Saudi Aramco launched an expansion program to increase the combined capacity of the three existing plants to 148 Mm^3/d while constructing a 40-Mm^3/d gas processing plant at Hawiyah. The MGS transmission system is to be expanded to 188 Mm^3/d. The Ju'aymah natural gas liquids (NGL) plant was also being expanded through the installation of a third fractionation train that will raise capacity by 300,000 bbl/d to 600,000 bbl/d bringing total NGL plant capacity to 900,000 bbl/d including the 300,000 bbl/d-capacity Yanbu NGL plant (Arab Petroleum Research Center, 1998, p. 375).

Saudi Arabia was the largest producer and exporter of methanol in the Arabian Gulf. In 1997, the Ar Razi plant production capacity of 1.28 Mt/yr was expanded with the addition of a third methanol plant; this raises Ar Razi capacity to 2.13 Mt/yr. Saudi Arabia's second methanol plant, the Ibn Sina plant, had a production capacity of 900 t/yr. In addition to marketing methanol from these two domestic facilities, Saudi Basic Industries Corp. (SABIC) also marketed methanol from Bahrain.

Petrochemicals.—SABIC ranked as the world's third largest producer of petrochemicals, accounting for 23.7 Mt of chemicals, petrochemicals, and plastics. The principal markets for these products were the Far East and Western Europe. New facilities were scheduled to come on-stream in 1998 at Ibn Rushd and additional capacity was slated to come on-stream in 1999 at Ar Razi, Ibn Al Baytar, and Kemya, which should result in an upsurge of petrochemical exports at the close of the decade (Arab Petroleum Research Center, 1998, p. 385).

SABIC planed to expand petrochemical production at Saudi Yanbu Petrochemical Co. Upstream expansion will be limited by the availability of feedstock from Saudi Aramco, which transports raw materials through a 1,000-km pipeline from the Arabian Gulf to Yanbu on the Red Sea coast. In 1997, Saudi Arabia was the world's largest producer of the fuel additive, methyl tertiary butyl ether (MTBE); affiliates of SABIC had a total production capacity of 2.8 Mt/yr of the gasoline additive.

The Alujain Corp. had a 850,000-t/yr-capacity MTBE plant under construction in Yanbu. The technical services and project management consultant was Bechtel of the United States. The plant completion is scheduled for early 2000. Planned feedstock totals are 12,000 bbl/d of butane from the Yanbu fractionation center and 9,000 bbl/d to be transported by tanker from the East Coast of the Arabian Peninsula.

Petroleum.—Production.—In 1997, Saudi Arabia maintained an average production level of 8.56 Mbbl/d, including output from the Partitioned Zone where production is shared with Kuwait. Nearly two-thirds of the output consisted of the higher priced

crudes—more than 4 Mbbl/d of Arabian Light (34° API gravity), about 950,000 bbl/d of Arabian Extra Light (38° API gravity), and 200,000 bbl/d of Arabian Super Light (50.4° API gravity)—to maximize revenues while operating within the production quota allotted by OPEC. Saudi Arabia's quota for the period between 1993 and 1997 was 8 Mbbl/d, not inclusive of the crude oil from the Partitioned Zone. The new OPEC quota allotted for 1998 was 8.76 Mbbl/d. Because oil prices remained low in 1998, Saudi Arabia negotiated a production restraint agreement in March 1998 with other petroleum-exporting nations that resulted in a 300,000-bbl/d cut in Saudi production.

Located in the center of the Kingdom, in the Najd region, four new fields came on-stream in 1994—Ghinah, Hawtah, Hzmiyah, and Umm Jurf. The fields are linked to the central production station at Hawtah which included a 200,000-bbl/d gas oil separator plant. Development of the fifth field in the region, the Nuayyim Field, was reactivated in September 1997 after being postponed in 1995.

The Ash Shaybah Field in the remote southeast with reserves of 14 billion barrels of 41.6° API gravity crude oil came on-stream in 1998 at 200,000 bbl/d rising to 500,000 bbl/d by early 1999. At that time, the export crude known as Arab Light (38° API) is expected to be replaced by the Shaybah blend with API gravity of 38.4°. The blend will consist of 40.74% Abqaiq, 37.04% Shaybah, and 22.22% Berri crude.

By 2000, Saudi Arabian Texaco anticipates that a $500-million development program will result in the doubling of production to 400,000 bbl/d from its onshore fields in the Partitioned Zone. At that time, the company will also begin recovering and marketing associated natural gas, which here-to-fore, was flared. In the same time period, the Arabian Oil Co. has a development program for increasing the combined production capacity of the Khafji and the Hout Fields to 350,000 bbl/d.

Refining.—The combined capacity of eight refineries, including the 30,000-bbl/d Al Khafji refinery in the Partitioned Zone, was about 1.7 Mbbl/d. *(See table 2.)*

Saudi Aramco's Ras Tanura refinery was undergoing a $1.5-billion upgrading and expansion, including the installation of a 100,000-bbl/d hydrocracker, a 40,000-bbl/d continuous catalytic reformer, a 60,000-bbl/d visbreaker, a sulfur recovery unit, a hydrogen plant, and a sour-water-treatment plant. The units were scheduled to come online in mid-1998 raising Ras Tanura's capacity from 265,000 bbl/d to 300,000 bbl/d. Foster Wheeler of the United States was awarded a project management contract for the $1.8-billion upgrading of the Rabigh refinery. The upgrading was designed to improve efficiency, as well as to increase output of light products—gasoline, jet fuel, and kerosene. This upgrading would enable Saudi Aramco to satisfy growing domestic demand for gasoline which is projected to reach 260,000 bbl/d by 2000. The demand for gasoline in recent years has ranged from 200,000 to 220,000 bbl/d. (Alexander's Gas & Oil connections, July 23, 1997, Saudi Arabia is upgrading its refineries, News and Trends—Middle East, v. 3, issue 3, accessed on April 21, 1998, at http://www.gasandoil.com/goc/news/ntm73003.html). Saudi Aramco also was engaged in major revamping of its domestic distribution network that involved laying product pipelines from the refineries to the Kingdom's major consumption and export areas. In addition to its indigenous refineries, Saudi Arabia acquired a worldwide network of refining, storage, and distribution facilities. These include 50% equity in the Motor Oil Theodori Hellas' Corinth refinery in Greece, the Thalin Refinery in China, the Sangyong Oil Refining Co. in the Republic of Korea, the Aghii refinery in the Philippines, and the Star Enterprise in the United States. Saudi Aramco had a direct interest in downstream refining and market ventures that can process up to 1.4 Mbbl/d of the Kingdom's crude oil.

Reserves

Saudi Arabia has the world's largest known concentration of oil, representing more than 26% of total proven world reserves. Proven oil reserves are 263.5 billion barrels, including 2.5 billion barrels contained in the Saudi Arabian share of reserves in the Partitioned Zone. Saudi Arabia is enjoying a reserve-to-production ratio sufficient to last about 90 years at current production levels. The bulk of the Kingdom's reserves were contained in a few massive fields in the northeast. These included Ghawar, the world's largest onshore field, with remaining reserves of about 70 billion barrels; Safaniya, the world's largest offshore field with 19 billion barrels; Abqaiq, 17 billion barrels; Berri, 11 billion barrels; Manifa, 11 billion barrels; Zuluf, 8 billion barrels; Ash Shayba, 7 billion barrels; Abu Saafa, 6 billion barrels; and Khursaniya, 3.5 billion barrels.

Natural gas reserves were reported by Saudi Aramco to be 5.88 trillion cubic meters including 99 billion cubic meters in the Partitioned Zone. Most of the Kingdom's reserves were in the form of associated gas contained in the country's oilfields. The giant Ghawar Field accounted for approximately 35% of the total gas reserves. Non associated natural gas accounted for nearly 2 trillion cubic meters including two 1997 discoveries (Arab Petroleum Research Center, 1998, p. 355).

Infrastructure

Electric power generation and distribution are conducted under the regional authorities of the Saudi Consolidated Electric Companies operating powerplants with a combined installed capacity of more than 20,000 MW. Additional power-generation capacity (2,750 MW) is under the authority of the Saline Water Conversion Corp., which operates seawater-desalination plants. Electric power installed capacity is scheduled to increase to about 28,000 MW in 2000 and to 60,000 MW in 2020. In 1997, 56% of the generating capacity is provided by gas-fired power stations.

Saudi Arabia is the world's largest producer of desalinated water. In 1997, installed capacity exceeded 2 Mm^3/d. Expansion plans parallel industrial requirements.

Extensive port and harbor facilities served Al Jubayl on the east coast with access to the Arabian Gulf and Yanbu on the west coast with access to the Red Sea. Al Jubayl had an industrial port with a 10-km-long causeway for dry and liquid bulk cargo and a commercial port for general cargo. The fertilizer terminal consists of two jetties for loading 5,000- to 50,000 deadweight ton (dwt) vessels. The oil terminal at Yanbu was expanded to handle 6.6 Mbbl/d and could accommodate tankers from 80,000 to 500,000 dwt (Middle East Economic Digest, 1997).

Outlook

Saudi Aramco intends to maintain a maximum sustainable crude oil capacity of approximately 10 Mbbl/d. To implement this plan, less-profitable fields will be shut down as new producing fields come on-stream. Revenue increases can be anticipated through cutting back on the sale of Arabian heavy in favor of the lighter premium crudes from recently developed fields south of Riyadh. The United States and Saudi Arabia share a common concern about regional security, oil exports and imports, and sustainable development. The continued availability of reliable sources of oil, particularly from Saudi Arabia, remains important to the prosperity of the United States, as well as to Europe and Japan. Saudi Arabia maintains 2 Mbbl/d of surplus capacity to respond to crises.

Because most of the national income is dependent upon markets outside the Kingdom, the economy remains vulnerable to sudden changes in volume and pattern of worldwide trade in crude and refined petroleum and petrochemicals. Direct investment in foreign refining, marketing, and distribution operations should provide stability in the face of inevitable market fluctuations. Equities purchased in foreign refining, marketing, and distribution companies reduced the Kingdom's vulnerability. Saudi Aramco, however, recently canceled a proposed refining project in Portugal because downstream opportunities in Asia, particularly in India, were more promising. The Kingdom plans to build a long-term downstream presence in the region.

Saudi Arabia adopted an integrated view of the best use of natural resources and will develop natural gas reserves to satisfy the escalating demand for electricity in the Kingdom and to increase the availability of more oil for export. During the next 25 years, investments as much as $140 billion will be required to meet domestic power requirements (Wall Street Journal, 1997). The economy has progressed rapidly, and the standard of living has improved significantly. Dependence on petroleum revenues will continue, but industry and agriculture now account for a larger share of economic activity. The creation of Ma'aden should allow the mining sector to contribute more efficiently to the Kingdom's economic development. The economy is expected to witness sustained growth during the next 10 years as the proposed mining projects are implemented.

References Cited

Arab Petroleum Research Center, 1998, Saudi Arabia: Arab Oil & Gas Directory—1998, p. 349-404.

Energy Information Administration, 1998, Petroleum supply monthly: Energy Information Administration, DOE/EIA 0109 (9802), 151 p.

Fertilizer Week, 1997, New Saudi company may speed rock project: Fertilizer Week, v. 11, no. 5, June 16, p. 2.

Metal Bulletin, 1997, Green light for Saudi Arabia refinery: Metal Bulletin, no. 8172, March 27, p. 5.

———1998, Saudi zinc mining project moves ahead: Metal Bulletin, no. 8246, January 22, p. 7.

Middle East Economic Digest, 1997, The rich seams of Arabia's mines: Middle East Economic Digest, v. 41, no. 51, p. 3.

———1998a, Arabian Shield mining venture takes shape: Middle East Economic Digest, v. 42, no. 5, January 30, p. 24.

———1998b, Cement output drops, surplus remains: Middle East Economic Digest, v. 42, no. 23, June 5, p. 27.

Northern Miner, 1997, Boliden's Canadian launch off to strong start: Northern Miner, v. 83, no. 25, August 18, p. 2.

Wall Street Journal, 1997, Saudi Arabia: Wall Street Journal, October 20, p. A12.

Major Sources of Information

Ministry of Petroleum and Mineral Resources
Deputy Ministry for Mineral Resources
P.O. Box 345
SA-21191 Jiddah, Saudi Arabia
Telephone: [966] (2) 667-4800
Fax: [966] (2) 667-2265

Saudi Arabian Oil Co. (Saudi Aramco)
Dhahran 31311, Saudi Arabia
Telephone: [966] (3) 875-5830
Fax: [966] (3) 873-7664

Al Jubayl Fertilizer Co. (SAMAD)
P.O. Box 10046
Al Jubayl, Saudi Arabia
Telephone: [966] (3) 341-6488
Fax: [966] (3) 341-5894

National Chemical Fertilizer Co. (Ibn Al Baytar)
P.O. Box 10283
Al-Jubayl 31961, Saudi Arabia
Telephone: [966] (3) 341-9988
Fax: [966] (3) 358-7385

Saudi Arabian Basic Industries Corp. (SABIC)
P.O. Box 5101
Riyadh 11422, Saudi Arabia
Telephone: [966] (1) 401-2033
Fax: [966] (1) 401-2045

Saudi Iron and Steel Co. (Hadeed)
P.O. Box 10053
Al Jubayl 31961, Saudi Arabia
Telephone: [966] (3) 357-1500
Fax: [966] (3) 358-7440

Saudi Company for Precious Metals, Ltd.
P.O. Box 12948
SA-21483 Jiddah, Saudi Arabia
Telephone: [966] (2) 667-2472
Fax: [966] (2) 660-2561

Publications

Kingdom of Saudi Arabia, Ministry of Finance and National Economy, Central Department of Statistics, Statistical Yearbook, annual.

Saudi Arabian Monetary Agency, Research and Statistics Department, Statistical Summary, annual.

Kingdom of Saudi Arabia, Directorate General of Mineral Resources Atlas of Industrial Minerals, Jiddah, Saudi Arabia, 1993.

Kingdom of Saudi Arabia, Directorate General of Mineral Resources, Mineral Resources of Saudi Arabia Jiddah, Saudi Arabia, 1994.

TABLE 1
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Ore, mine output:						
Gross weight 2/		859,353	900,000 e/	1,400,000 e/	1,569,205	1,600,000
Copper content of concentrate and bullion 3/		925	917	925 e/	834 e/	703 4/
Gold content of concentrate and bullion 2/ 3/	kilograms	7,519	7,630 e/	8,080	7,530 r/	7,260 4/
Lead content of concentrate e/ 3/		50	50	50	50	50
Silver content of concentrate and bullion 2/ 3/	kilograms	17,990	16,990	16,900 e/	16,608	17,200 4/
Zinc content of concentrate e/ 3/		542 4/	500	500	500	619 4/
Iron and steel:						
Direct-reduced iron	thousand tons	2,015	2,111	2,129	2,300 r/	2,110 4/
Iron and steel; metal, steel, crude	do.	2,318	2,411 e/	2,451	2,683 r/	2,539 4/
Ferroalloys	do.	--	--	--	20,000 e/	83,000
INDUSTRIAL MINERALS						
Barite		2,000 r/	5,000 r/	6,000 r/	8,000 e/	5,500 4/
Caustic soda		NA	NA	NA	450,000	450,000
Cement, hydraulic	thousand tons	15,300	16,000	15,773	16,437	15,400 4/
Gypsum, crude		326,661	375,000	370,000	362,589	365,000
Lime e/		150,000	160,000	175,000	180,000	160,000
Nitrogen:						
N content of ammonia	thousand tons	1,097	1,340	1,327	1,386 r/	1,405 4/
N content of urea	do.	780	994	980	1,010	930 4/
Pozzolan		NA	NA	NA	144,000 e/	145,000
Salt		60,000	60,000	90,000	140,000	140,000 4/
Stone, dimension e/		500,000	500,000	500,000	450,000	450,000
Sulfur; byproduct, hydrocarbons e/	thousand tons	2,400	2,300	2,400	2,300	2,400
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural: 5/						
Gross	million cubic meters	67,300	68,000 e/	73,900	77,700 r/	80,300 4/
Dry	do.	35,900	37,700 e/	38,030	41,340	43,900 4/
Natural gas liquids: e/						
Propane	thousand 42-gallon barrels	120,450 4/	120,500	147,500	147,000	150,000
Butane	do.	56,575 4/	56,600	60,000	60,000	65,000
Natural gasoline and other	do.	40,150 4/	45,000	48,000	47,400	48,900
Total	do.	217,175 4/	222,100	255,500	254,400	263,900 4/
Petroleum:						
Crude	do.	2,990,000	2,970,000	3,004,300	2,999,550	3,080,235 4/
Refinery products:						
Liquefied petroleum gases	do.	14,965	13,000 e/	11,315	12,000 e/	12,000
Gasoline	do.	89,425	92,800	85,000	94,462 r/	95,000
Jet fuel	do.	25,200	30,000 e/	21,900	23,000 r/	23,000
Kerosene	do.	35,770	36,450 e/	36,865	40,875 r/	41,000
Distillate fuel oil	do.	171,800	169,800	172,280	191,990 r/	192,000
Residual fuel oil	do.	180,700	156,640	167,200	180,565 r/	181,000
Unspecified	do.	62,580	73,900 e/	73,400	68,000 r/	68,000
Total	do.	580,440	572,590 e/	567,960	610,892 r/	612,000

e/ Estimated. r/ Revised. NA Not available.

1/ Table includes data available through December 31, 1998.

2/ Production from Mahd Adh Dhahab and Sukhaybirat gold operations.

3/ Mahd Adh Dhahab produces a bulk flotation concentrate containing copper, gold, lead, silver, and zinc and a crude bullion containing copper, gold, and silver.

4/ Reported figure.

5/ Includes Saudi Arabian one-half share of production in the Saudi Arabia-Kuwait divided zone.

TABLE 2
SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of facilities	Annual capacity
Barite	metri	The International Trading and Technical Establishment	Jiddah	6,000
Cement		Saudi Consolidated Cement Co. (Government, majority shareholder)	Ayn Dar, 75 kilometers southwest of Dammam	1,875
Do.		do.	Al Hufuf	1,800
Do.		Arabian Cement Co. Ltd. (Government, 100%)	Rabigh	2,000
Do.		Southern Province Cement Co. (Government, 100%)	Suq Al Ahad, 10 kilometers northeast of Jizan	2,500
Do.		do.	Bishah, 550 kilometers southeast of Jiddah	1,300
Do.		Yanbu Cement Co. (Government, 100%)	Yanbu	1,500
Do.		Yamama Cement Co. (Government, 100%)	Riyadh	3,000
Do.		Qasim Cement Co. (Government, 100%)	Buraydah	1,400
Ferroalloys		Gulf Ferroalloys Co. (SABAYEK) (United Gulf Industries Corp., 26%; SABIC, 15%; Demetal Aussenhandelsgesellschaft, 7%; remainder owned by Arab investors and financial institutions)	Al Jubayl	105
Fertilizer:				
Urea		Al Jubayl Fertilizer Co. (SAMAD) (SABIC, 50%; Taiwan Fertilizer Corp., 50%)	do.	632
Ammonia		do.	do.	300
Dioctyl phthalate		do.	do.	50
2-EH		do.	do.	150
Urea		National Chemical Fertilizer Co. (Ibn Al Baytar) (SABIC, 50%; SAFCO, 50 %)	do.	500
Granular urea		do.	do.	500
Ammonia, liquid		do.	do.	500
NPK		do.	do.	500
TSP		do.	do.	200
DAP		do.	do.	100
Liquid fertilizer		do.	do.	10
Urea		Saudi Arabian Fertilizer Co. (SAFCO), (SABIC, 41%; Saudi Arabian private interests, 59%)	Dammam	330
Ammonia		do.	do.	200
Sulfuric acid		do.	do.	100
Melamine		do.	do.	20
Ammonia		do.	Al Jubayl	500
Granular urea		do.	do.	600
Gold:				
Ore		Mahd Adh Dhahab Mining Company (Ma'aden) (Government, 100%)	Mahd Adh Dhahab, 270 kilometers northeast of Jiddah	180
Metal	kilograms	do.	do.	5,000
Ore		The Saudi Company for Precious Metals (SCPM) (Ma'aden, 50%; Boliden International Mining, 50%)	Sukhaybirat, 480 kilometers northwest of Riyadh	1,300
Metal	kilograms	do.	do.	2,800
Refinery	metric tons	Dhahab Company Ltd. (Saudi private interests, 51%; Thomson-C.S.F., 49%)	Jiddah	110
Natural gas	million cubic meters	Saudi Aramco (Government, 100%)	All oilfields, Eastern Province	60,000
Do.	do.	do.	Khuff Zone, Eastern Province	20,150
Do.	do.	do.	Abqaiq Gas Cap, Eastern Province	4,600
Natural gas liquids 1/	million barrels	do.	Shedgum, 150 kilometers southwest of Dammam	60
Do.	do.	do.	Uthmaniya, 30 kilometers west of Al Hufuf	120
Do.	do.	do.	Berri, 15 kilometers north of Al Jubayl	25
Do.	do.	do.	Ju'aymah, 33 kilometers northwest of Ras Tanura	110
Do.	do.	do.	Yanbu	110
Petrochemicals:				
Ethylene		Saudi Petrochemical Co. (SADAF) (SABIC, 50%; Pecten Saudi Arabia, 50%)	Al Jubayl	970
Ethylene dichloride		do.	do.	560
Styrene		do.	do.	360

See footnotes at end of table.

TABLE 2--Continued
SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of facilities	Annual capacity
Petrochemicals--continued:				
Industrial ethanol		Saudi Petrochemical Co. (SADAF) (SABIC, 50%; Pecten Saudi Arabia, 50%)	Al Jubayl	300
Methyl-tertiary-butyl-ether/ Ethyl-tertiary-butyl-ether		do.	do.	700
Caustic soda		do.	do.	450
Methanol		National Methanol Co. (Ibn Sina) (SABIC, 50%; Celanese Arabian, 25%; Texan Eastern Arabian, 25%)	do.	900
Methyl-tertiary-butyl-ether		do.	do.	700
Methanol		Saudi Methanol Co. (Ar Razi) (SABIC, 50%; Japan Saudi Arabia Methanol Co., 50%)	do.	2,130
Ethylene glycol		Eastern Petrochemical Co. (SHARQ) (SABIC, 50%; Saudi Petroleum Development Corp., 50%)	do.	450
LLD Polyethylene		do.	do.	660
Ethylene-1 and 2		Arabian Petrochemical Co. (Petrokemya) (SABIC, 100%)	do.	1,150
Butene-1		do.	do.	100
Polystyrene		do.	do.	135
Propylene		do.	do.	300
Butadiene		do.	do.	100
Benzene		do.	do.	70
HAO Polyethylene		Al Jubayl Petrohemical Co. (Kemya)	do.	170
HD Polyethylene		(SABIC, 50%; Exxon Chemical Arabia, Inc., 50%)	do.	170
LLD Polyethylene		do.	do.	60
Methyl-tertiary-butyl-ether		Saudi European Petrochemical Co. (Ibn Zahr) (SABIC, 70%; Ecofuel, 10%; Neste Oy, 10%; Arab Petroleum Investments Corp., 10%)	do.	1,400
Polypropylene		do.	do.	800
Polyester fibers		Arabian Industrial Fiber Co. (Ibn Rushd) (SABIC, 48%; SAFCO, 10%; National Industrialization Co., 10%; other private interests, 32%)	Yanbu	140
Ethylene		Saudi Yanbu Petrochemical Co., (YANPET) (SABIC, 50%; Mobil Oil Corp, 50%)	do.	500
Ethylene glycol		do.	do.	220
Polyethylene		do.	do.	96
Petroleum, crude	million barrels	Saudi Aramco (Government, 100%)	Eastern Province, Najd Region, and offshore	3,600
Do.	do.	Arabian Oil Co., (AOC), (Japan Petroleum Trading Co., 80%; Kuwait, 10%; Saudi Arabia, 10%)	Khafji 2/	110
Do.	do.	do.	Al Hout 2/	10
Do.	do.	Saudi Arabian Texaco	Wafra, South Fawaris, South Umm Gudair 2/	50
Petroleum products		Saudi Aramco (Government, 100%)	Ras Tanura	110
Do	do.	Rabigh Petroleum Refining Co. (Saudi Aramco, 100%)	Rabigh	119
Do	do.	Jubail Petroleum Refining Co. (Saudi Aranco, 50%; Shell, 50%)	Al Jubayl	110
Do.	do.	Yanbu Petroleum Refining Co. (Saudi Aramco, 50%; Mobil, 50%)	Yanbu	127
Do.	do.	Saudi Aramco (Government, 100%)	do.	69
Do	do.	Jiddah Oil Refinery Co. (Saudi Aramco, 100%)	Jiddah	38
Do.	do.	Riyadh Oil Refinery Co. (Saudi Aramco, 100%)	Riyadh	50
Do.	do.	Arabian Oil Co. (Japan Petroleum Trading Co., 80%; Kuwait, 10%; Saudi Arabia, 10%)	Al Khafji	11
Steel		Saudi Iron and Steel Co. (Hadeed)	Al Jubayl	2,700
Do.		(SABIC, 95%; DEG Corp., 05%)	Jiddah	245
Stone, dimension		Bin Laden Group (Private, 100%)	do.	450,000
Do.		Red Sea Mining	do.	55,000
Do		Saudi Marble & Granite	Riyadh	50,000
Do.		Tinhat Co.	do.	50,000

See footnotes at end of table.

TABLE 2--Continued
SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of facilities	Annual capacity
Titanium dioxide	The National Titanium Dioxide Co. (Cristal) (Shairco for Trading and Contracting, 25%; National Industrialization Co., 24%; Gulf Investment Corp., 24%; Kerr-McGee Chemical Corp., 25%; private individuals, 2%)	Yanbu	52
Zinc	Arabian Shield Company for Mining Industries (Arabian Shield Development Co., 50%; Al Mashreq Company for Mining Investments, 50%)	Al Masane	(3/)

1/ Natural gas is pumped through the Master Gas System to processing plants at Berri, Shedgum, and Uthmaniya where natural gas liquids are separated and sent by pipeline to fractionation plants at Ju'aymah and Yanbu.
2/ Partitioned Zone where production is shared between Saudi Arabia and Kuwait.
3/ Company holds a 30-year lease on 44 square kilometers with mineable reserves of 7.2 million tons of ore containing zinc, copper, silver, and gold.