

THE MINERAL INDUSTRY OF SAUDI ARABIA

By Bernadette Michalski

The world's largest producer of crude oil, the Kingdom of Saudi Arabia, accounting for 13% of the total world output in 1996, achieved a significant diversity in its mineral industry in recent years through the development of gold mining operations and of value-added cement, fertilizer, petrochemical, and steel manufacturing facilities. Awaiting exploitation are bauxite, iron ore, phosphate, and polymetallic base metal 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 more than 75%, or \$35.9 billion,¹ of Government revenues in 1996. Economic conditions improved appreciably in 1996; most of the improvement was attributable to the sharp increase in oil prices. Consequently the petroleum sector accounted for more than 37% of the gross domestic product compared with 35% in 1994. The mining sector brought \$666 million in profits, most of it in the form of profits to the private sector (E & M J, 1997).

Government Policies and Programs

Emphasis was placed on the diversification and expansion of the economic base while securing a more-balanced allocation of resources among the different regions of the Kingdom. The Deputy Ministry for Mineral Resources (DMMR) has enlisted the cooperation of the U.S. Geological Survey and the Bureau de Recherches Géologiques et Minière 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. The Government has focused on development of the Kingdom's resources of bauxite, copper, gold, iron ore, phosphate rock, and zinc. The Government continued to encourage private capital to participate in the Kingdom's economic development to the extent of offering low-interest loans to qualified companies.

Preparations were underway for the establishment of the Saudi Arabian Mining Company (Ma'adin). Ma'adin's capitalization is planned at more than \$1 billion and will be wholly owned by the State. The company is to spearhead exploration and mining activities in Saudi Arabia on a commercial and profitable basis. It is also to engage in downstream-related industries rather than limiting its scope to

the production of raw materials. The company is to study and propose possible changes in mining legislation to 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 Jubail and Jeddah 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 and procedures for environmental protection, such as emission controls and the monitoring of air and water pollution. 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 1996, the average production of crude oil, the Kingdom's principal mineral commodity, was 8.2 million barrels per day (Mbb/d) including the Saudi Arabian share of production from the Divided Zone. (See table 1.) Although actual production capacity is 10 Mbb/d, output has been averaging 8 Mbb/d in recent years in accordance with the quota assigned by the Organization of Petroleum Exporting Countries (OPEC).

Trade

The Kingdom's trade surplus for all goods reached \$29 billion, climbing from \$22.8 billion in 1995. Exports were predominantly hydrocarbon products and derivatives accounting for 88% of total exports, which were valued at \$55.4 billion. Crude oil exports averaged 6.3 Mbb/d and petroleum product exports averaged 850,000 barrels per day (bbl/d). During 1996, Europe imported 1.8 Mbb/d of crude oil and petroleum products, and Japan imported 1.3 Mbb/d. Petroleum imports by the United States totaled more than 1.4 Mbb/d, including 114,000 bbl/d of petroleum products, mostly unfinished oils, liquefied petroleum gases, motor gasoline, and petrochemical feedstock. Saudi Arabia remained the leading supplier to the United States, accounting for 15% of U.S. petroleum imports in 1996 (Energy Information Administration, 1997). Annual imports of minerals were valued at about \$1.4 billion.

The value of nonoil exports increased rapidly during the past

¹Where necessary, values have been converted from Saudi riyals (SRIs) to U.S.dollars at the rate of SRIs3.7450=US\$1.00.

decade. In 1996, they were valued at \$6.5 billion rising from about \$1 billion in 1983. As more industries come on-stream, this trend was expected to continue.

The Kingdom's total imports were valued at \$26 billion in 1996. The United States remained the largest supplier to the Kingdom and accounted for 21% of Saudi Arabia's imports. Japan was second with 12% of the market share, followed by the United Kingdom and Germany each at 8% (International Monetary Fund, 1996).

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.

The 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 also, 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 exploration and development.

Commodity Review

Metals

Aluminum.—Reynolds Metals of the United States was selected to supply technology for and to manage and operate a new aluminum canmaking plant in Dammam. The plant was scheduled to produce up to 1.2 billion beverage cans per year.

The Al-Amoudi Brothers Co. of Saudi Arabia and the Aluminium Processing Co. of Germany formed a joint venture creating the Causi Aluminium Recycling Co. in the Al-Jubayl Industrial Estate. The plant's capacity to recycle scrap and beverage cans ranged from 12,000 to 18,000 metric tons per year (t/yr).

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

Copper.—The Alujain Corp. of Saudi Arabia has placed a hold on its plans to develop a large copper deposit in the

Arabian Shield about 340 km northeast of Jidin Jabal Sayid. The deposit was defined at 80 Mt grading 1.5% copper. The proposed 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 has 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 Mahd Adh Dhabab underground mine, 275 km northeast of Jiddah, and at the Sukhaybirat surface mine, about 480 km northwest of Riyadh. Production from Mahd Adh Dhabab exceeded 5 metric tons (t), and production at Sukhaybirat approached 3 t in 1996. As of yearend, proven ore reserves at the open-pit mine were 750,000 t grading 2.2 grams per metric ton (g/t) of gold.

The Saudi Company for Precious Metals, Ltd. (SCPM) is developing a major gold deposit adjacent to the Sukhaybirat open-pit mine involving excavation to the 150-meter level bringing 3.5 Mt of inferred reserves into the proven ore reserve category. This includes 2 Mt grading 2.3 g/t of gold and 1.5 Mt of heap-leach material grading 0.73 g/t of gold. In addition, SCPM has stockpiled 1.75 Mt of material at an average grade of 1.0 g/t of gold, which will be processed in 1998 and 1999 in conjunction with ore mined from the extended excavation. Several other commercially significant gold deposits have been discovered in the Arabian Shield. The Al-Amar Mine is now under development. The Al-Hajar, As-suq, and Khnaiguiyah deposits are awaiting development.

The Dhabab Co. Ltd., a Saudi Arabian/French joint venture, operated a gold refinery at Jiddah.

Iron and Steel.—A feasibility study by British Steel Consultants recommended construction of a 2.2-million-metric-tons-per-year (Mt/yr) pelletizing plant to process concentrates from the Wadi Sawawin iron ore deposit 60 km from the Red Sea coast and 900 km north of Jiddah. The iron content of the fine-grained taconite ore body ranged from 42% to 45%. Pilot plant tests produced a concentrate with an iron content of 67.5% at a 75% recovery rate. The method of beneficiation developed for the project requires 1 cubic meter of clean water for every metric ton of ore processed. The basic iron ore agglomeration technology was developed by using the Tilden process pioneered by the U.S. Bureau of Mines in the 1970's. The projected startup date was 1997.

The Saudi Iron and Steel Co. issued a contract for construction of the third-stage expansion of its Al Jubayl complex in April 1996, with completion scheduled in 1999 at which time total production capacity will increase from its present 2.7 Mt/yr to 3.5 Mt/yr of various steel semi-

manufactures.

Zinc.—The Arabian Shield Development Co. of Dallas, Texas, and two Saudi Arabian partners jointly obtained an industrial license to 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 a total of 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 cyanidization plant to be built at the mine site. Financing of 50% of the cost, or \$44 million, as an interest-free loan is anticipated from the Saudi Industrial Development Fund. The Arabian Shield Development Co.'s Saudi Arabian partners are to provide \$22 million, and a like amount is to be derived from commercial banks in Saudi Arabia and the Gulf area. The remaining financing was expected to be derived from equity offerings.

Industrial Minerals

Cement.—Production capacity totals about 14 Mt/yr of clinker and 15 Mt/yr of cement from seven manufacturers. New facilities are scheduled to come on-stream in 1997 and 1998, raising total capacity to 19.6 Mt/yr of clinker and 20.9 Mt/yr of cement. Construction activity maintained strength through 1996; cement consuming construction projects are, however, expected to slow in 1997, moving Saudi Arabia into the international cement and clinker export trade (International Cement Review, 1997).

Fertilizers.—A reorganization of the Kingdom's fertilizer industry was implemented by the merger of three state-owned companies—the National Chemical Fertilizer Co., the Saudi Arabian Fertilizer Co., and the Al-Jubayl Fertilizer Co. These companies have the combined capacity to produce nearly 4 Mt/yr of fertilizers. The merger was intended to increase efficiency and boost earnings as a part of a general effort to reduce the budget deficit.

Abundant reserves of low-cost feedstocks formed the basis of the Arabian Gulf fertilizer industry. The regional fertilizer producers were poised to become dominant suppliers of nitrogen fertilizers in the international market.

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'adin, the proposed state mining company, and a consortium of private companies. Possible participants are the Saudi Binladin Group with Raytheon of the United States, the Al-Murjan Minerals Technology Company with IMC fertilizer of the United States, and Saudi Oger. The beneficiation process was expected to produce 4.5 Mt/yr of phosphate concentrate that will be transported 1,200 km to Al-Jubayl. The original feasibility

study proposed using a slurry pipeline to transport the concentrates; a railway system, however, now seems to be favored (Middle East Economic Digest, 1997).

Mineral Fuels

Natural Gas.—Most of Saudi Arabia's natural gas reserves are associated with petroleum production. The Ghawar Field accounts for more than one-third of the Kingdom's natural gas reserves. There were 64 gas-oil separation plants in the country. The Kingdom's Master Gas System had the capacity to process 45 billion cubic meters of natural gas. This amount was associated with a crude oil production of about 8.2 Mbbbl/d. With the completion of an expansion program to bring sustainable crude oil production capacity to 10 Mbbbl/d, Saudi Aramco's focus shifted to the expansion of natural-gas-processing installations and distribution networks. Among the major projects under development were the expansion of the Ju'aymah natural gas liquids (NGL) plant capacity by 300,000 bbl/d, construction of a fourth natural-gas-processing plant servicing natural gas extracted from the Khuff reservoir, and the augmentation of the Uthmaniyah natural gas handling capacity. Saudi Aramco is also expanding the three gas processing plants of its master gas system. ABB Lummus Global of the United States should complete the expansion of the Berri plant in 1997 adding 10 million cubic meters per day (Mm³/d) for a total natural gas processing capacity of 30 Mm³/d. Other plants scheduled for makeovers are the Shedgum Plant where gas processing capacity is to be increased to 57 Mm³/d and the Uthmaniyah Plant to 58 Mm³/d.

The production of NGL substantially increased during the past few years with combined output now exceeding 600,000 bbl/d. Of this figure, about 4,800 bbl/d was exported, sustaining Saudi Arabia's position as the world's foremost exporter of NGL.

Saudi Arabia was the largest producer of ammonia and methanol in the Arabian Gulf, the largest methanol exporter, and the third largest ammonia exporter. Natural gas remained an inexpensive feedstock at \$0.45 per million British thermal units. Total ammonia production capacity exceeded 1.6 Mt/yr.

Saudi Arabia was one of two Arabian Gulf countries to produce methanol. The Al-Razi plant production capacity of 1,400 t/yr was the largest in the world, and 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.—In 1996, Sabic ranked as the world's third largest producer of petrochemicals, accounting for 22.8 Mt, which represented an increase of about 4% over that of 1995. The principal markets for these products were the Far East and Western Europe. New facilities are scheduled to come on-stream in 1997-98 at Ibn Rushd and Ar Razi, and additional capacity is slated to come on-stream in 1999 at Ibn al-Baytar and Kemya, which should result in an upsurge of petrochemical exports at the close of the decade.

Sabco plans to expand petrochemical production at Saudi Yanbu Petrochemical Company (Yanpet). 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. Saudi Arabia is the world's largest producer of the fuel additive, methyl tertiary butyl ether (MTBE). Affiliates of Sabco had a total production capacity of 2.8 Mt/yr of the gasoline additive in 1996.

The Alujain Corp. has a MTBE plant under construction in Yanbu. The technical services and project management consultant is Bechtel of the United States. The plant is scheduled to have a 850,000-t/yr capacity with production beginning in mid-1999. The plant will be owned by a new company called National Fuel Additives Co. This will be the first private sector MTBE plant in the Kingdom.

Petroleum.—Production.—In 1996, Saudi Arabia maintained an average production level of nearly 8.2 Mbbbl/d, including output from the Divided Zone. Nearly two-thirds of the output consisted of the higher priced crudes—about 4 Mbbbl/d of Arabian Light (34° API gravity), another 900,000 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 Mbbbl/d. The new OPEC quota allotted for 1998 is 8.76 Mbbbl/d. Located in the center of the Kingdom, in the Najd region, four new fields came on-stream in late 1994. The fields yielded about 200,000 bbl/d of crude oil designated as Arab Super Light. A fifth field in the region is under development and is expected to come on-stream in late 1997, boosting production from the area to 275,000 bbl/d. Saudi Aramco announced plans to develop the Shuaybah Field in the southeast in the Rub Al Khali. Field production is estimated by the company to be from 500,000 to 600,000 bbl/d of 42° API gravity low-sulfur crude oil. Because of the field's remoteness, development cost is estimated to be \$2 billion and completion is anticipated in late 1998 or early 1999.

Refining.—The combined capacity of eight refineries, including the 30,000-bbl/d Al-Khafji refinery in the Divided Zone, was 1,640 Mbbbl/d. (See table 2.)

Saudi Aramco downsized its ambitious 10-year refinery upgrade and expansion of its Ras Tanura refinery from a planned \$12.5 billion upgrade to a more-modest \$1.7 billion upgrade and expansion. The revised upgrade plans called for the installation of a 100,000-bbl/d hydrocracker, a 40,000-bbl/d continuous catalytic reformer, a visbreaker, a sulfur recovery unit, a hydrogen plant, and a sour-water-treatment-plant; the upgrades were scheduled to come online in mid-1998. A major upgrade of the Rabigh refinery was undertaken in 1996 at a cost of \$1.8 billion. The upgrade entails installation of 12 new units that will enable the refinery to produce greater volumes of gasoline, kerosene, and jet fuel while reducing the volume of heavier products. Saudi Aramco also was engaged in major revamping of its domestic distribution network that involves laying product pipelines from the refineries to the Kingdom's

major consumption and export areas.

Saudi Arabia continued to acquire a worldwide network of refining, storage, and distribution facilities. The purchase of 50% equity in Motor Oil Hellas' Corinth refinery in Greece introduced Saudi Aramco to its first downstream presence in Europe, adding to existing interests in the Thalin Refinery in China, in the Sangyong Oil Refining Co. in the Republic of Korea, in Petron in the Philippines, and in 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 Mbbbl/d of the Kingdom's crude oil. The company's long-term goal was to refine and market one-half of its crude output through companies in which it has an ownership interest. Negotiations for further positions in China, France, India, Indonesia, and Italy continued. Direct investment in foreign refining, marketing, and distribution operations established for Saudi Arabia a guaranteed market for crude oil and provided stability in the face of inevitable market fluctuations.

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 261.5 billion barrels, including 2.5 billion barrels contained in the Saudi Arabian share of reserves in the Divided Zone. Saudi Arabia is enjoying a reserve-to-production ratio sufficient to last nearly 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; Abqauq, 17 billion barrels; Berri, 11 billion barrels; Manifa, 11 billion barrels; Zuluf, 8 billion barrels; Shuayba, 7 billion barrels; Abu Saafa, 6 billion barrels; and Khursaniya, 3.5 billion barrels. The more-recently discovered fields in the central region of the Kingdom should add from 6 billion to 9 billion barrels to the reserve when appraisal and delineation work is completed (Arab Petroleum Research Center, 1997).

Natural gas reserves were reported by Saudi Aramco to be 5.4 trillion cubic meters including 96 billion cubic meters in the Divided Zone. Most of the Kingdom's reserves were in the form of associated gas contained in the country's oilfields. The giant Ghawar Field was thus the largest source of natural gas and accounted for approximately 35% of the total gas reserves (Arab Petroleum Research Center, 1997).

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 megawatts (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 from nearly 22,000 MW to about 28,000

MW in 2000 and 60,000 MW in 2020. Currently, 56% of the generating capacity is provided by gas-fired power stations, 42% by steam power stations, and 2% by oil-fired power stations.

Saudi Arabia is the world's largest producer of desalinated water. Current installed capacity exceeds 2 M m³/d. Expansion plans parallel industrial requirements.

Extensive port and harbor facilities served Al-Jubayl on the east coast and Yanbu on the west coast. 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 vessels from 5,000 to 50,000 deadweight tons (dwt). In Yanbu, the 15-km-long King Fahd Industrial Port was the largest oil port on the Red Sea and one of the longest in the world. The oil terminal at Yanbu was expanded to handle 6.6 Mbb/d and could accommodate tankers from 80,000 to 500,000 dwt.

Outlook

The Kingdom's business climate had developed favorably since the Gulf War, contributing to a significant construction boom. State and private companies were expanding. Saudi Aramco's expansion program placed the Kingdom in a position to take advantage of the expected growth in world oil demand later in this decade.

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. Purchasing equities in refining, marketing, and distribution companies in the United States, the Republic of Korea, the Philippines, and Europe eased that vulnerability.

Because Saudi Aramco intends to maintain a maximum sustainable capacity of 10 Mbb/d, 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 its lighter premium crudes. The level of Saudi Arabian oil production is one of the main factors that will influence world oil prices in 1998, because of the 10% increase in the production quota allotted by OPEC.

The expanding cement industry will require suitable export facilities for handling bulk materials. Saudi Seaports Authority will have to make rapid adjustments to accommodate the additional cement capacity anticipated in 1998-99.

The creation of Ma'adin 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 plans are implemented.

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Major Sources of Information

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TABLE 1
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1992	1993	1994	1995	1996 e/
METALS					
Ore, mine output:					
Gross weight 2/	806,000	859,353	900,000 e/	1,400,000 r/ e/	1,569,205 3/
Copper content of concentrate and bullion 4/	868	925	917	925 e/	834
Gold content of concentrate and bullion 2/ 4/ kilograms	5,626	7,519	7,630 e/	8,080	8,302 3/
Lead content of concentrate e/ 4/	150	50	50	50	50
Silver content of concentrate and bullion 2/ 4/ kilograms	17,780	17,990	16,990	16,900 e/	16,608 3/
Zinc content of concentrate 4/	525	542	500 e/	500 e/	500
Iron and steel:					
Direct-reduced iron thousand tons	1,611	2,015	2,111	2,129	2,200
Iron and steel: Metal, steel, crude do.	1,823	2,318	2,411 e/	2,451	2,500
INDUSTRIAL MINERALS					
Barite	--	--	2,000	8,000	8,000
Caustic soda	NA	NA	NA	NA	450,000
Cement, hydraulic thousand tons	15,324	15,300	16,000	15,773 r/	16,437
Gypsum, crude	269,298	326,661	375,000	375,000 e/	362,589
Lime e/	150,000 r/	150,000 r/	160,000 r/	175,000 r/	180,000
Nitrogen: N content of ammonia thousand tons	741	1,097	1,340	1,327	1,300
Pozzolana	NA	NA	NA	NA	144,000
Salt	60,000 r/	60,000 r/	60,000	90,000	90,000
Sulfur: Byproduct, hydrocarbons e/	2,370 3/	2,400	2,300	2,400	2,400
Urea	644	650	1,300 e/	1,500 e/	1,800
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural: 5/					
Gross million cubic meters	66,100	67,300	68,000 e/	73,900 r/	80,000
Dry do.	34,000	35,900	37,700 e/	38,030 r/	41,340
Natural gas liquids:					
Propane thousand 42-gallon barrels	114,245	120,450	120,500 e/	147,500 r/ e/	147,000
Butane do.	59,495	56,575	56,600 e/	60,000 r/ e/	60,000
Natural gasoline and other do.	43,435	40,150	45,000 e/	48,000 r/ e/	47,400
Total do.	217,175	217,175	222,100 e/	255,500 r/ e/	254,400
Petroleum:					
Crude do.	3,100,000	2,990,000	2,970,000	3,004,300	2,999,550
Refinery products:					
Liquefied petroleum gases do.	13,505	14,965	13,000 r/ e/	11,315 r/	12,000
Gasoline do.	88,695	89,425	92,800	85,000 r/	85,000
Jet fuel do.	21,170	25,200	30,000 r/ e/	21,900 r/	22,000
Kerosene do.	35,400	35,770	36,450 e/	36,865 r/	36,900
Distillate fuel oil do.	163,880	171,800	169,800	172,280 r/	172,000
Residual fuel oil do.	179,550	180,700	156,640	167,200 r/	167,000
Unspecified do.	64,970	62,580	73,900 e/	73,400 r/	73,000
Total 9/ do.	567,170	580,440	572,590 r/ e/	567,960 r/	567,900

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

1/ Table includes data available through December 31, 1997.

2/ Production from Mahd Dhahab and Sukhaybirat gold operations.

3/ Reported figure.

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

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 FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of facilities	Annual capacity
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	1,700
Do.	Southern Province Cement Co. (Government, 100%)	Suq al-Ahad, 10 kilometers northeast of Jizan	2,500
Do.	Yanbu Cement Co. (Government, 100%)	Yanbu	1,300
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%; Sabc, 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
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.	300
Sulfuric acid	do.	do.	100
Melamine	do.	do.	20
Ammonia	do.	Al-Jubayl	500
Granular urea	do.	do.	600
Gold:			
Ore	General Organization for Petroleum and Mineral Resources (Petromin) (Government, 100%)	Mahd Adh Dhahab, 270 kilometers northeast of Jiddah	180
Metal	kilograms		5,000
Ore	The Saudi Company for Precious Metals (Petromin, 50%; Boliden International Mining, 50%)	Sukhaybirat, 480 kilometers northwest of Riyadh	700
Metal	kilograms		2,800
Natural gas	million cubic meters	Saudi Aramco (Government, 100%)	35,000
Do.	do.	do.	20,150
Do.	do.	do.	4,600
Natural gas liquids 1/	million barrels	do.	60
Do.	do.	do.	120
Do.	do.	do.	20
Do.	do.	do.	110
Do.	do.	do.	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
Industrial ethanol	do.	do.	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%; Texas Eastern Arabian, 25%)	do.	900
Methyl-tertiary-butyl-ether	do.	do.	700

See footnotes at end of table.

TABLE 2--Continued
SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of facilities	Annual capacity
Petrochemicals--Continued:				
Methanol		Saudi Methanol Co. (Al-Razi) (Sabic, 50%; Japan Saudi Arabia Methanol Co., 50%)	do.	1,400
Ethylene glycol		Eastern Petrochemical Co. (Sharq) (Sabic, 50%; Saudi Petroleum Development Corp., 50%)	Al-Jubayl	450
LLD polyethylene		do.	do.	660
Ethylene		Arabian Petrochemical Co. (Sabic, 100%)	do.	1,150
Polystyrene		do.	do.	135
Propylene		do.	do.	300
Butadiene		do.	do.	100
Benzene		do.	do.	70
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
Petroleum, crude	million barrels	Saudi Aramco (Government, 100%)	Eastern Province, Najd Region, and offshore	3,500
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, and South Umm Gudair 2/	50
Petroleum products		Saudi Aramco (Government, 100%)	Ras Tanura	97
Do	do.	Rabigh Petroleum Refining Co. (Saudi Aramco, 50%; Petrola, 50%)	Rabigh	119
Do.	do.	Jubail Petroleum Refining Co. (Saudi Aramco, 50%; Shell, 50%)	Al-Jubayl	113
Do.	do.	Yanbu Petroleum Refining Co. (Saudi Aramco, 50%; Mobil, 50%)	Yanbu	110
Do.	do.	Saudi Aramco (Government, 100%)	do.	69
Do.	do.	Jiddah Oil Refinery Co. (Saudi Aramco) (Government, 100%)	Jiddah	38
Do.	do.	Riyadh Oil Refinery Co. (Saudi Aramco)	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) (Sabic, 95%)	Al-Jubayl	2,400
Do.		Jiddah Steel Rolling Mill (Sulb) (Government, 100%)	Jiddah	245
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

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/ Divided zone where production is shared between Saudi Arabia and Kuwait.