



2011 Minerals Yearbook

SAUDI ARABIA

THE MINERAL INDUSTRY OF SAUDI ARABIA

By Philip M. Mobbs

The Kingdom of Saudi Arabia was a leading producer of liquid hydrocarbons, which included condensate, crude oil, and natural gas liquids. The country held 16% of the world's total proved crude oil reserves, which ranked it first in the world. Prior to the recent (2011) revision of Canadian reserves to 175 billion barrels (Gbbbl) from 32 Gbbbl that was attributed to its oil sands, Saudi Arabia had accounted for 19% of the world's crude oil reserves. The Kingdom ranked 9th in the world in terms of petroleum refining capacity and was the 28th ranked steel producer. A variety of industrial minerals and metals also were produced in Saudi Arabia (table 1; BP p.l.c., 2011, p. 6; 2012, p. 6, 16; World Steel Association, 2012).

All mineral deposits are the exclusive property of the state. The Supreme Council for Petroleum and Mineral Affairs defines and approves national hydrocarbon policies and strategies. The Ministry of Petroleum and Mineral Resources implements general policy related to minerals, natural gas, and oil. The Deputy Ministry for Mineral Resources administers activity in the mining sector and promotes the mineral industry. Mining is regulated by Royal Decree No. 47 M (the Mining Investment Code) of 20 Sha'ban 1425 (October 4, 2004). The Saudi-Sudanese Red Sea Commission manages the mineral resources on the Red Sea seabed that are located in water depths greater than 1,000 meters (m).

Minerals in the National Economy

Saudi Arabia's economy remained strongly linked to hydrocarbon production. The oil sector accounted for 57% of the nominal gross domestic product in 2011. The volume of crude oil exported by Saudi Arabian Oil Co. (Saudi Aramco), which was the Government oil company, increased by about 20% to 2.42 Gbbbl in 2011, and exports of refined petroleum products decreased by about 8% to 123 million barrels. In 2011, the value of Saudi Arabia's total exports increased by about 45% to \$365 billion¹ from \$251 billion in 2010. Mineral products (primarily crude oil) accounted for 87% of total Saudi Arabian exports in 2011, and chemical products (primarily petrochemicals) accounted for 4% (Saudi Arabian Monetary Agency, 2012, tables 7-2, 9-7; Saudi Arabian Oil Co., 2012, p. 46).

In 2011, about 58% of Saudi Arabia's crude oil exports was shipped to Asia, and about 16% was shipped to the United States. Asian countries also bought about 54% of Saudi Arabian exports of refined petroleum products and about 26% of its exports of natural gas liquids (Saudi Arabian Oil Co., 2012, p. 33).

Production

In 2011, notable increases in production were reported for crude oil and refined petroleum products and were estimated for ammonia, cement, limestone, and sand and gravel. Significant

decreases were estimated for low-grade bauxite and kaolin. Data on mineral production are in table 1.

Structure of the Mineral Industry

Through the Public Investment Fund, the Government maintained majority ownership interest in most of the large companies that operated in the mineral sector, which included Saudi Basic Industries Corp. (SABIC) and Saudi Arabian Mining Co. (Ma'aden). The Ministry of Petroleum and Mineral Resources supervised its affiliate companies in the petroleum sector; these included Aramco Gulf Operation Ltd. and Saudi Aramco. Aramco Gulf Operation and Saudi Arabian Chevron Inc. (which was a subsidiary of Chevron Corp. of the United States) worked in the Partitioned Neutral Zone between Kuwait and Saudi Arabia on behalf of the Ministry. The Ministry also supervised the Saudi Geological Survey.

Domestic and international companies and their joint ventures were involved in metal exploration and mining activity. Domestic companies dominated operations in the industrial mineral sector. Crude oil exploration and production in Saudi Arabia was restricted to Saudi Aramco, which also formed joint ventures with international firms to explore for natural gas and to refine petroleum.

Commodity Review

Metals

Aluminum.—In late 2010, the Ma'aden Aluminium Co. and the Ma'aden Rolling Co. were incorporated by owners Ma'aden (74.9% equity interest) and Alcoa Inc. of the United States (25.1% interest). The joint-venture partners also incorporated the Ma'aden Bauxite and Alumina Co. in January.

Construction of the joint venture's aluminum project was underway. The project included a 1.8-million-metric-ton-per-year (Mt/yr)-capacity alumina refinery, a 740,000-metric-ton-per-year (t/yr)-capacity aluminum smelter, and a 380,000-t/yr-capacity aluminum rolling mill, which were located at Ras Az Zawr (also known as Ras Al-Khair) [about 90 kilometers (km) northwest of Jubail]. The rolling mill and the smelter were scheduled to start operations in 2013. Initially, the smelter was slated to use imported alumina, which would be supplied by Alcoa. Commercial production of alumina was expected to begin in 2014. The refinery was to be supplied by a 4-Mt/yr-capacity bauxite mine at Al Baitha (Alcoa Inc., 2011; Saudi Arabian Mining Co., 2012, p. 70).

Copper, Gold, Silver, and Zinc.—In 2011, Ma'aden Gold and Base Metals Co., which was a subsidiary of Ma'aden, produced 1,619 kilograms (kg) of gold and 4,252 metric tons (t) of zinc from Al Amar Mine; 1,540 kg of gold and 682 t of zinc from the Mahd Adh-Dahab Mine; about 1,070 kg of gold from the Bulghah Mine's carbon-in-leach facility that processed

¹Where necessary, values have been converted from Saudi Arabian riyals (SAR) to U.S. dollars (US\$) at the fixed rate of SAR3.75=US\$1.00.

the mine's lower grade ore [less than 1 gram per metric ton (g/t) gold]; about 205 kg of gold from the Sukhaybarat plant, which processed the higher grade ore (more than 1 g/t gold) from the Bulghah Mine; and about 179 kg of gold from the Al Hajar Mine. Processing of ore from the Shirs pit near the Al Hajar Mine was expected to be completed in 2012 (Saudi Arabian Mining Co., 2012, p. 58).

Exploration for additional gold resources continued at the Bulghah and the Mahd Adh-Dahab Mines. A study of the potential development of the copper resources at Al Hajar was ongoing. Exploration of the Central Arabian Gold Region (CAGR) included the Ad Duwayhi, Al Humaymah, Ar Rjum (the Al Wasimah and the Um Al Na'am deposits), As Suq, Bir Tawilah, Mansourah, and Masarrah prospects. The proposal to transport treated water from Taif to the CAGR was approved, and a contract to build a 430-km water pipeline was awarded. The water would be used to process ore from the planned new gold projects. Ma'aden Gold and Base Metals completed a feasibility study for a gold mine at As Suq. Construction of the mine was expected to be completed in 2013. Evaluation of the Ad Duwayhi gold deposit advanced; mine construction was expected to be completed by 2014. An initial resource estimate of 97.8 million metric tons of ore with an average grade of 0.54 g/t gold was completed for the Bir Tawilah project in 2011. Prefeasibility studies were expected to begin in 2012 at Al Humaymah Ar Rjum, Mansourah, and Masarrah (Saudi Arabian Mining Co., 2012, p. 11, 38–39, 58–59, 66).

Alara Resources Ltd. of Australia (50% equity interest) and United Arabian Mining Co. (Manajem) established the joint-venture company Khnaiguiyah for Mining Company LLC (KMC) to hold the exploration and mining licenses for the Khnaiguiyah zinc project. KMC's drilling program, which included diamond and reverse-circulation holes, was expanded to about 35,000 m from the initially proposed 5,000-m program. A definitive feasibility study for the project was begun in 2011; the study was expected to be completed in mid-2012 (Alara Resources Ltd., 2011a, p. 6, 11; 2011b, p. 7).

Al Masane Al Kobra Mining Co., which was a venture of the Arabian American Development Co. of the United States and local investors, completed underground construction work on the Al Masane copper-gold-silver-zinc project, which was located in southwestern Saudi Arabia. In November, the mine was turned over to the mining contractor China National Geological and Mining Corp., which initiated mining operations. By October 2012, mine output averaged about 1,500 metric tons per day of ore (Arabian American Development Co., 2012a, b).

In 2011, Barrick Gold Corp. of Canada acquired Equinox Minerals Ltd. of Canada. Equinox Resources Ltd., which was a subsidiary of Equinox Minerals, had acquired Citadel Resources Group of Australia, whose subsidiary (Bariq Mining Ltd. of Saudi Arabia) held a mining license for the Jabal Sayid copper and gold project. Mine construction at Jabal Sayid was expected to be completed in 2012. At full production, the mine was expected to produce about 50,000 t/yr of copper in concentrate (Barrick Gold Corp., 2012, p. 42).

The joint venture of Diamond Fields International Ltd. of Canada and Manafa International Trade Co. of Saudi Arabia

continued to evaluate the offshore Atlantis II Deeps project, which is located about 115 km west of Jeddah. The Gold and Minerals joint venture of Abdul Rahman Saad Al-Rashid & Sons Company Ltd. of Saudi Arabia (60% interest) and Kefi Minerals Plc of the United Kingdom (40% interest) was granted the Selib North exploration license. Gold and Minerals began field work and remote sensing studies.

The Deputy Ministry for Mineral Resources received a number of applications for exploration licenses (primarily for copper and gold) from Syrah Resources Saudi Arabia LLC, which was a subsidiary of Syrah Resources (KSA) Proprietary Ltd. In November, Syrah Resources Ltd. of Australia announced that it had signed a memorandum of understanding to sell 90% equity interest in its subsidiary [Syrah Resources (KSA) Proprietary] to ANR Resources Private Ltd. of Singapore, which expected to complete the acquisition in early 2012 (Syrah Resources Ltd., 2011; Thomson Reuters, 2012).

Iron Ore.—In November, National Mining Co. of Saudi Arabia awarded a pre-construction engineering and design contract for the Wadi Sawawin iron ore project to STX Heavy Industries, which was a subsidiary of the STX Group of the Republic of Korea. The Korea Development Bank agreed to be the project's financing advisor. Subject to financing and Government approval, construction of the Wadi Sawawin project, which included a mine and a direct-reduced iron facility, was scheduled to begin in 2013. Initial output was projected to begin in late 2015 (London Mining Plc, 2011).

Industrial Minerals

Magnesite.—Ma'aden Industrial Minerals Co. completed the construction of a magnesite mine at Zarghat, and subsequently began commercial production of caustic calcined magnesia at its processing plant in the Al Madinah Al-Munawwara industrial city, which is located about 17 km southwest of Medina. Ma'aden Industrial Minerals expected to begin commercial production of dead-burned magnesia in 2012 (Saudi Arabian Mining Co., 2012, p. 9).

Nitrogen and Phosphate Rock.—In 2011, Ma'aden Phosphate Co. began commercial production of ammonia. The plant was a segment of Ma'aden's 3-Mt/yr-capacity diammonium phosphate (DAP) fertilizer complex, which was under construction at Ras Az Zawr. Ma'aden reported that the initial shipment of phosphate rock concentrate from the mine at Al Jalamid was moved by rail to Ras Az Zawr, and that the production of phosphoric acid and sulfuric acid had started at the Ras Az Zawr facility. Commercial production of DAP was expected to begin in 2012 (Saudi Arabian Mining Co., 2011a, b; 2012, p. 12).

Mineral Fuels

Natural Gas and Petroleum.—In 2011, a new oilfield was discovered by Saudi Aramco with the Wedyan-1 exploration well, and Saudi Aramco spudded its first shallow-water exploration well in the Red Sea. Development of the offshore Karan sour (high sulfur content) gasfield in the Persian Gulf was about 90% complete. Initial production from the

Karan field reached about 11 million cubic meters per day. Work continued on the construction of the Khursaniyah gas plant, the development of the Manifa oilfield, and the project to sustain the production capacity of the Safaniya oilfield. By 2013, the Khursaniyah gas plant was expected to handle about 510 million cubic meters per day of sour gas from the Karan gasfield and 2 million cubic meters per day of associated sour gas and 65,000 barrels per day (bbl/d) of sour condensate from the Manifa oilfield (Saudi Arabian Oil Co., 2012, p. 18, 20–22).

Also in the northeast, development drilling of the Arabiyah and the Hasbah offshore gasfields started in 2011. Construction continued on the Wasit gas plant, which would handle output from the Arabiyah and the Hasbah gasfields, and on the Shaybah natural gas liquids recovery plant. Both plants were expected to be completed in 2014 (Saudi Arabian Oil Co., 2012, p. 23–24).

Crude oil refineries under construction in 2011 included a 400,000-bbl/d-capacity refinery for Saudi Aramco Total Refining and Petrochemical Co., which was expected to be completed in 2013. The proposed 400,000-bbl/d-capacity heavy crude oil refinery of Yanbu Aramco Sinopec Refining Co., which formerly was known as the Red Sea Refining Co., was expected to be completed by 2014. The proposed 400,000-bbl/d-capacity Jazan Refinery and Terminal project was scheduled to be operational by 2016 (Saudi Arabian Oil Co., 2012, p. 30–31).

Outlook

With its significant crude oil production capacity and resources, Saudi Arabia is well placed to meet international demand for petroleum. Ongoing infrastructure development, which includes the expansion of the national highway and railroad network and the construction of new cities with associated industrial and residential facilities, is likely to maintain the short-term demand for construction minerals and products, such as cement, glass, sand, steel, and stone. The Kingdom's encouragement of private investment in mineral projects is expected to remain attractive to domestic and international investors.

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TABLE 1
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity ²	2007	2008	2009	2010	2011 ^e	
METALS						
Bauxite, low grade, for cement	--	150 ^e	246	284	206 ³	
Copper content of concentrate and bullion	metric tons	737	1,465	1,719	1,603	1,620
Ferroalloys ^e	do.	85,000	90,000	90,000	90,000	90,000
Gold content of concentrate and bullion	kilograms	4,440	4,527	4,857	4,476	4,611 ³
Iron and steel:						
Low-grade iron ore, for cement		642	581	600 ^e	700 ^e	750
Direct-reduced iron		4,340	4,970	5,000	5,500	5,800
Steel, crude		4,600	4,670	4,700	5,000	5,300
Lead content of concentrate	metric tons	123	600 ^e	347	543	550
Silver content of concentrate and bullion	kilograms	9,028	8,232	8,527	7,670	7,900
Zinc content of concentrate	metric tons	716	3,663	4,952	4,897	4,934 ³
INDUSTRIAL MINERALS						
Barite	metric tons	30,000	30,000 ^e	30,000	30,000	30,000
Cement, hydraulic		30,369	31,823	36,500	42,300	48,000
Clays:						
Kaolin	metric tons	4,415	15,000 ^e	4,166	6,200 ^{r,e}	5,000
Other, for brick and tile		3,900	5,000	4,700	5,800	6,000
Feldspar	metric tons	73,000	55,000 ^e	55,000	42,300	43,000
Fertilizer, phosphatic, P ₂ O ₅ content ^e		300	300	300	300	300
Gypsum, crude		2,100	2,300	2,000	2,100	2,300
Lime ^e		400	400	400	400	400
Nitrogen:						
N content of ammonia		2,600	2,500 ^e	2,400 ^e	2,500 ^e	2,800
N content of urea		1,850	1,700 ^e	1,600 ^e	1,700 ^e	1,700
Salt		1,507	1,600	1,640	1,800	1,800
Sand and stone:						
Aggregate		234,000	248,000	259,000	277,000	277,000
Basalt		--	--	--	--	--
Dolomite		465	465	669	583	600
Granite		954	1,100	1,100 ^e	1,300 ^e	1,300
Limestone:						
Blocks		308	242	522	704	700
For cement		33,447	36,100	46,900	45,749	52,000
Marble ^e	metric tons	85,000	85,000	85,000	100,000	100,000
Pozzolana and scoria		784	810	802	915	1,000
Sand and gravel		26,000	22,000	19,000	26,000	29,000
Schist		--	--	--	573	600
Silica sand (glass sand)		820	799	709	820	830
Sulfur, byproduct, hydrocarbon processing	metric tons	3,089,223	3,163,346	3,213,678	3,200,000	3,200,000
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	82,665	86,158	88,432	97,000 ^r	102,000
Dry (methane)	do.	61,900	68,000	65,000	72,000 ^r	76,000
Ethane	do.	10,700	10,600	11,500	13,800	14,500
Petroleum:						
Crude oil	million 42-gallon barrels	3,114	3,266	2,888	2,887	3,310
Natural gas liquids:						
Propane	thousand 42-gallon barrels	143,681	146,048	152,262	168,513	175,800 ³
Butane	do.	92,684	94,483	100,679	106,640	113,900 ³
Condensate	million 42-gallon barrels	94	93	83	94	93 ³
Natural gasoline and other	thousand 42-gallon barrels	63,926	68,195	74,468	75,924	78,480 ³

See footnotes at end of table.

TABLE 1—Continued
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity ²	2007	2008	2009	2010	2011 ^e	
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued:						
Refinery products:						
Liquefied petroleum gases	thousand 42-gallon barrels	11,521	11,300	13,677	12,846 ⁴	12,000
Gasoline and naphtha	do.	188,644	200,610	180,076	167,807 ⁴	205,000
Jet fuel and kerosene	do.	67,282	69,680	56,674	45,957 ⁴	61,000
Distillate fuel oil	do.	238,496	247,440	210,778	196,453 ⁴	229,000
Residual fuel oil	do.	174,385	174,380	158,944	122,705 ⁴	152,000
Unspecified ⁵	do.	15,041	17,960	17,034	18,212 ⁴	18,700
Total	do.	695,369	721,370	637,183	563,980	677,700

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^fRevised. do. Ditto. -- Zero.

¹Table includes data available through October 4, 2012.

²In addition to commodities listed, low-grade bauxite, carbon black, magnesite, methanol, and phosphate rock were produced, but available information is inadequate to make reliable estimates of output.

³Reported figure.

⁴Does not include refined output of Rabigh Refining & Petrochemical Co.

⁵Includes asphalt.

TABLE 2
SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bauxite, low-grade for cement	Ma'aden Industrial Minerals Co. [Saudi Arabian Mining Co. (Ma'aden)]	Central zone, Az Zabirah area	250,000.
Cement:			
Gray portland	Al Jouf Cement Co.	South of Turaif	1,700.
Do.	Arabian Cement Co. Ltd.	Rabigh	4,800.
Do.	Eastern Province Cement Co.	Al Khursaniyah	3,400.
Do.	Najran Cement Co.	About 160 kilometers northwest of Najran	3,000.
Do.	Northern Region Cement Co.	About 190 kilometers west-northwest of Arar	1,700.
Do.	Qassim Cement Co.	Jal al Watah, 18 kilometers north of Buraydah	4,000.
Do.	Riyadh Cement Co.	About 30 kilometers southwest of Riyadh	3,800.
Do.	Saudi Cement Co.	Al Hofuf, about 120 kilometers southwest of Dammam	8,600.
Do.	Southern Province Cement Co. (Government, 52%)	Suq Al Ahad, 10 kilometers northeast of Jizan	2,600.
Do.	do.	Bishah, 550 kilometers southeast of Jiddah	2,000.
Do.	do.	Tihama	1,800.
Do.	Tabuk Cement Co.	Tabuk	1,300.
Do.	Yamama Cement Co. Ltd.	Riyadh	6,300.
Do.	Yanbu Cement Co.	Yanbu	4,000.
White	Al-Gharbiah Cement Factory	Jeddah	250.
Do.	Saudi White Cement Co.	About 30 kilometers southwest of Riyadh	200.
Copper, Cu content of ore	Ma'aden Gold and Base Metals Co. [Saudi Arabian Mining Co. (Ma'aden)]	Al Amar Mine, Ar Riyadh Province, and Mahd Adh-Dahab Mine, Al Madinah Province	1,000.
Gold	kilograms do.	Al Amar Mine, Ar Riyadh Province; Al-Hajar Mine, Asir Province; Bulgah Mine, Al Madinah Province; Mahd Adh-Dahab Mine, Al Madinah Province; and Sukhaybarat plant, Al Madinah Province	8,000.

See footnotes at end of table.

TABLE 2—Continued
SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Kaolin		Ma'aden Industrial Minerals Co. [Saudi Arabian Mining Co. (Ma'aden)]	Central zone, Az Zabirah	50,000.
Magnesium:				
Magnesite ore	do.		Mine at Zarghat	NA.
Magnesia, caustic calcined	do.		Processing plant, Al-Madinah Al-Munawwara industrial city, southwest of Medina	39.
Petroleum:				
Crude	million barrels	Saudi Arabian Oil Co. (Saudi Aramco) (Government, 100%)	Eastern Province, Najd Region, and offshore; includes the Ghawar, the Hawtah, the Khurais, the Safaniya, and the Shaybah fields	4,500.
Refined products	do.	Jeddah Oil Refinery Co. [Saudi Arabian Oil Co. (Saudi Aramco), 100%]	Jeddah	38.
Do.	do.	Rabigh Refining & Petrochemical Co. (PetroRabigh) [Saudi Arabian Oil Co. (Saudi Aramco), 50%, and Sumitomo Chemical Co., 50%]	Rabigh	140.
Do.	do.	Riyadh Oil Refinery Co. [Saudi Arabian Oil Co. (Saudi Aramco), 100%]	Riyadh	50.
Do.	do.	Saudi Arabian Oil Co. (Saudi Aramco) (Government, 100%)	Ras Tanura	193.
Do.	do.	do.	Yanbu	82.
Do.	do.	Saudi Aramco Mobil Refinery Co. Ltd. [Saudi Arabian Oil Co. (Saudi Aramco), 50%, and Mobil Yanbu Refining Company Inc., 50%]	do.	140.
Do.	do.	Saudi Aramco Shell Refining Co. [Saudi Arabian Oil Co., (Saudi Aramco), 50%, and Shell Saudi Arabia Refining Ltd., 50%]	Al Jubayl	110.
Phosphate rock		Ma'aden Phosphate Co. [Saudi Arabian Mining Co. (Ma'aden), 70%, and Saudi Basic Industries Corp. (SABIC), 30%]	Al Jalamid	11,600 ore, 5,000 concentrate.
Steel, crude		National Steel Co. Ltd. (Al Tuwairqi Group, 100%)	Dammam	800.
Do.		Saudi Iron and Steel Co. (Hadeed) [Saudi Basic Industries Corp. (SABIC), 100%]	Al Jubayl	5,200.
Titanium dioxide		The National Titanium Dioxide Co. Ltd. (Cristal) (Gulf Investment Corp. of Kuwait; National Industrialization Co. of Saudi Arabia; Shairco Trading Industry and Contracting of Saudi Arabia)	Yanbu	100.
Zinc, Zn content of ore		Ma'aden Gold and Base Metals Co. [Saudi Arabian Mining Co. (Ma'aden)]	Al Amar Mine, Ar Riyadh Province, and Mahd Adh-Dahab Mine, Al Madinah Province	2,000.

Do., do. Ditto. NA Not available.