

# THE MINERAL INDUSTRY OF REPUBLIC OF KOREA

By Chin S. Kuo

The gross domestic product of the Republic of Korea grew by more than 9% in 1995 because of increased exports and capital investment. A sharp increase in payments abroad for oil imports, fueled by rising crude oil import prices and growing domestic demand, has widened the current account deficit, which was about \$8.4 billion.<sup>1</sup> Inflation in the country remained below 4.5%.

The Government decided to allow new entries into the oil-refining and oil product distribution sectors. It planned to liberalize prices of petroleum products and to allow local firms easier access to the oil products import and export businesses. The revision of laws would boost local firms' international competitiveness.

The Government maintained cooperation with Australia, Indonesia, and Russia to strengthen bilateral economic and business ties involving oil, gas, and other mineral resources. It planned to strengthen cooperation with Kuwait, Malaysia, Saudi Arabia, and Vietnam in a bid to maintain supplies of crude oil at stable prices.

The mining sector contributed only 1.9% to the overall industrial production. Output of coal, industrial minerals, and quarrying was more significant than that of metals. Total mine production in 1995 was 6.5% less than that in 1994. Anthracite production has steadily declined over the years. The 1995 output decreased by 23% from that of 1994. (See table 1.)

Russia agreed to pay back part of its huge debt in aluminum to the Republic of Korea. Russia was to supply aluminum valued at \$90 million as part of a repayment plan totaling \$457 million. Russia also would supply steel worth \$135.2 million to contribute to paying off the debt.

The Republic of Korea would soon become the third largest consumer of gold in Asia after Japan and Taiwan. The country was estimated to have been buying 90 metric tons per year (t/yr) of gold.

The Government owns and controls some of the country's large, mineral-related enterprises. Most state-owned companies have gradually gone public, and part of the Government interest has been divested to private investors, such as Pohang Iron and Steel Co. Ltd. (Posco). Labor shortage and mine shutdowns had plagued the mineral industry. Skilled workers were needed at mines and plants, and the Government was considering importing foreign workers. (See table 2.)

LG Metals Corp., a primary copper producer, enlisted Mitsubishi Materials Co. of Japan and Outokumpu Oy of Finland to provide technology to increase copper cathode output at its Onsan plant, which currently has a capacity of 170,000 t/yr. LG Metals' other plant at Changhang has a capacity of 50,000 t/yr from melting scrap and blister. The plan was to increase output at Onsan to 330,000 t/yr when the expansion was completed. Construction was to start in July 1995, and commission was expected in late 1997. The Mitsubishi continuous copper smelting technology would cost \$10 million. The country's copper demand was expected to grow by 4.3% to 484,200 t in 1995. Copper imports were projected to reach 260,000 t.

Posco signed a 50-50 joint-venture agreement with Cia Vale do Rio Doce (CVRD) of Brazil to build a \$215-million, 4-million-metric ton-per-year (Mt/yr) pellet plant by September 1998 at Tubarao, Brazil. Posco would have the right to buy 2.5 Mt/yr of pellets, and CVRD would sell the remaining 1.5 Mt/yr mainly to other Asian countries.

The country's crude steel capacity was expanded to 38.9 Mt/yr in 1995. Further expansion to 44.4 Mt/yr was planned for 1996. Posco planned to build a new blast furnace at Kwangyang. When completed in 1998, Posco would become the world's largest steelmaker, with a production capacity of 28 Mt/yr. Meanwhile, the Hyundai Group was planning an integrated steel mill with an investment of \$13 million. The mill would have a production capacity of 10 Mt/yr. However, the Government opposed the construction of more steel mills because additional capacities were not necessary. In 1995, Posco produced 23.35 Mt of steel.

Posco shipped cold-rolled, hot-rolled, galvanized steel sheets to General Motors Corp. of the United States for testing for auto body panels. Japanese automakers had signed agreements to purchase steel sheets from Posco.

USS-Posco Industries, a joint venture of USX Corp. and Posco at Pittsburg, California, produced 1.46 Mt/yr of cold-rolled products. The source of its hot-band feedstock would come from an even split between Posco and USS's Gary, Indiana, Works. Major capital-spending programs in the future could be the installation of a new galvanizing line to produce a higher value downstream product and the improvement to the tin mill by installing a new annealing line.

Posco planned to sell 10% of its joint-venture steel project

in Vietnam, Haiphong-based VSC-Posco Steel Corp., to Daewoo. Posco holds 50% of the joint venture and Vietnam Steel Corp. and Haiphong city government the rest. The \$56-million steel plant would have a capacity of 200,000 t/yr when completed in 1995.

Posco signed a letter of intent with China National Ferrous Metal Materials Corp. to set up a \$60-million joint venture in China to produce galvanized steel products. Posco was to hold a 70% stake in the joint venture, which would have a capacity to produce 100,000 t/yr of galvanized steel products.

The Arab Co. for Special Steel awarded a consortium led by Posco Engineering and Construction Co. a \$130-million contract to build a special steel plant at Sadat City in Egypt; the plant would have a capacity of 140,000 t/yr. Completion was due by early 1999.

Kangwon Industries Ltd. awarded an order to Schloemann-Siemag (SMS) AG of Germany to supply a combined billet/bloom/beam blank continuous caster for its Pohang plant. The caster would have a capacity of more than 1 Mt/yr when commissioned in May 1996. SMS also would supply descaling equipment and a complete finishing shop for its 550,000 t/yr medium sections mill.

Hyundai Pipe Co. Ltd. planned to invest \$500 million in a plant to produce cold-rolled steel beginning in 1997. The company agreed to buy \$220 million worth of equipment from Japanese and German suppliers. The German consortium led by SMS won orders of a continuous annealing line with a skin-pass mill and an electrolytic galvanizing line. The new plant would have an initial capacity of 1.3 Mt/yr of cold-rolled, surface-finished sheet. The company also proposed a 10-Mt/yr steel mill using the Corex process. A Corex unit could be designed to produce 3,200-metric ton-per-day (t/d) of hot metal and replace a blast furnace of similar output. Posco was to construct a Corex unit to produce 2,000 t/d at the Pohang Works.

Hanbo Steel Co. Ltd. awarded a contract to SMS of Germany for a \$1.4-million, combination cold-rolling line at its Ansan Bay mill. SMS also led a consortium to install a compact strip production (CSP) thin slab casting system at Hanbo Steel. The plant with a proposed capacity of 2 Mt/yr was expected to be commissioned in late 1995. Hot strip from the CSP line would be fed into the new cold-rolling line. In another development, Hanbo Steel signed a preliminary agreement for an 80-20 joint venture with Ferrominera del Orinico (FMO) of Venezuela. Hanbo Steel would be responsible for the installation of a beneficiation plant and other facilities, while FMO would provide the project's infrastructure and raw materials.

Sammi Steel Co.'s subsidiary, Sammi Atlas Inc. in Toronto, Canada, would install an argon-oxygen refining facility at Welland, Ontario. The \$15-million project was expected to be completed by June 1996. The Atlas specialty steels division produces stainless, tool, and other specialty products in ingot, blooms, billets, bars, and forgings.

Korea Zinc Ltd. and its affiliate, Youngpoong Corp., relied on MIM Holdings Ltd. of Australia for about 10% of the imported 600,000 t/yr of zinc concentrate. In May, MIM Holdings declared force majeure on zinc and bulk concentrate contracts from its idle Mount Isa base metals mine in Queensland, Australia. However, the Korean smelters were not affected. Korea Zinc boosted zinc output at its Onsan plant by 10,000 to 200,000 t/yr to meet domestic demand. Youngpoong produced 80,000 t/yr to reach a total of 280,000 t/yr in 1995.

Korea Zinc's Australian unit was considering to build a \$332-million electrolytic zinc smelter/refinery in Queensland. Construction of the plant was expected to start early 1996. The plant with a capacity of 160,000 t/yr would begin production in March 1998. The company currently has only minor mining and refined chemical operations in the United States and Canada. It agreed to purchase the zinc smelter, Big River Zinc Corp. of the United States, for \$52.5 million. Big River has a smelting capacity of 80,000 t/yr of zinc.

Korea Zinc and Inco Ltd. of Canada entered into a joint-venture agreement to conduct a detailed engineering study to develop a nickel project at Barro Alto, Brazil. The deposit was reported to contain 36 Mt of proven and probable lateritic ore reserves grading 1.94% nickel.<sup>2</sup> The proposed plant was designed to have a production capacity of 181,000 t/yr of nickel in matte. The product would be sold in the Asian market. Under the agreement, Korea Zinc and its affiliates have an option to acquire up to 49% of the joint venture.

Tong Yang Cement Corp. planned to invest \$3 million in a 10,000-t cement silo project in North Korea's Rajin-Sonbong area. The company also agreed to set up cement distribution facilities in the area.

Dong Ah Stone Co. Ltd. planned to double production of pink granite. Production expansion was planned from 50,000 cubic meters (m<sup>3</sup>) per month to 80,000 m<sup>3</sup> per month, with final increase to 100,000 m<sup>3</sup> per month. The quarry has a mine life of at least another 20 years.

Korea Gas Corp. signed a letter of intent with Liquefied Natural Gas Co. of Oman to purchase 3 Mt/yr of liquefied natural gas (LNG) for 25 years beginning in the year 2000. It also received first LNG shipment from Malaysia LNG, a unit of Petronas of Malaysia, at the Pyongtaek LNG terminal. Under the agreement, Malaysia LNG would supply 2 Mt/yr of LNG for 20 years. Korea Gas also signed a \$3.3-billion contract with Pertamina of Indonesia to purchase an additional 1 Mt/yr of LNG for 20 years. Korean and Russian business leaders agreed to jointly explore and develop a gasfield in Irkutsk, Siberia. The agreement called for the Koreans to form a consortium and to conduct a feasibility study with Russians, which was scheduled to begin in late August, 1995.

Honam Oil Refinery Co. started shipping 50,000 t of distillate fuel oil to North Korea as part of a United States-North Korean agreement to suspend North Korea's suspected

nuclear weapons program. The shipment was made from Yochon, South Cholla Province, to Sonbong, North Hamkyong Province, North Korea. Yukong Ltd. also won a contract to ship 40,000 t of Bunker-C fuel oil to North Korea beginning in August. Chinese tankers would carry the fuel oil from Ulsan to Sonbong, North Korea.

The country relied heavily on imports from the Middle East for most of its crude oil. Ssangyong Oil Refining Co. started operating a new crude distillation unit at Onsan. The unit was to have a crude refining capacity of 200,000 barrels per day (bbl/d). The country's five oil refiners reported a surge of 20.9% in combined sales for 1995. The purchase of naphtha and benzene by petrochemical firms increased sharply because of strong demand for petrochemical products. Some refiners planned to become exporters of gasoline to Japan in 1996. Gasoline demand was forecast to grow an average of 12.8% per year from 160,000 in 1995 to 181,000 bbl/d by 1997. Refining capacity expansion was forecast to reach 2 million bbl/d in 1996. Gasoline imports totaled 44,000 bbl/d in 1995.

Petroleum Development Corp. (Pedco) made its third oil and gas strike off Vietnam's southeastern coast in the Nam Con Son Basin in May, 1995. Pedco was operator in the block for a consortium that includes Daewoo, Hyundai, Samsung, and Shell Exploration. In April, Pedco found oil and gas in its second test well in the block.

Yukong Ltd. planned to build an oil refinery at Shenzhen, China. The company was to hold 90% of the refinery with a capacity of 100,000 bbl/d, and the parent, Sunkyong Ltd., would take up the rest. The refinery was to begin operation in the year 2000. According to Chinese regulations, the output from the refinery with 100% foreign equity would be exported. Yukong Ltd. (25%) also would take part in an oil exploration project at an offshore field in the Bangko block, Sumatra, Indonesia, with Santa Fe Resources Bangko (75%)

of the United States. The exploration program would last 6 years and might be extended to 10 years.

Pedco (12.5%) and Yukong Ltd. (12.5%) joined Marathon Oil Co. of the United States in exploring for oil and gas in the South China Sea. Marathon Oil signed a deal with China National Offshore Oil Corp. to explore a block covering 4,600 square kilometers. Test drillings were scheduled for the block until 1999. The two Korean firms also were separately launching seismic studies in the block off Shanghai.

Korea Electric Power Co. awarded equipment contracts worth \$200 million to Swedish-Swiss conglomerate, Asea Brown Boveri (ABB), for new units of the Yonggwang nuclear powerplant. ABB helped build two other units at Yonggwang in the past.

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<sup>1</sup>Where necessary, values have been converted from Korean won (W) to U.S. dollars at the rate of W771=US\$1.00 for 1995.

<sup>2</sup>Inco Media Information, Apr. 27, 1995, p. 1.

### **Major Sources of Information**

Korea Institute of Geology, Mining, and Materials  
30, Kajungdong, Yusongku, Taejon  
Ministry of Trade, Industry and Energy  
1, Chungang-dong, Kwach on, Kyonggi, Seoul

### **Major Publications**

Economic Planning Board, Seoul:  
Monthly Statistics of Korea.  
Korea Energy Economics Institute, Seoul:  
Yearbook of Energy Statistics.

TABLE 1  
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1991	1992	1993	1994	1995 e/
<b>METALS</b>					
Bismuth, metal	42	9	5 e/	-- e/	--
Cadmium, smelter e/	450	620	400	400	400
Copper:					
Mine output, Cu content e/	5 2/	4	5	5	31 2/
Metal:					
Smelter e/	202,000	210,000	220,000	224,000	223,000
Refined, primary	201,911	209,000	218,000 e/	244,169	234,895 2/
Gold, metal kilograms	20,809	23,263	25,000 e/	12,332	28,036 2/
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	222	222	219	191	190
Fe content do.	134	134	122	107	106
Metal:					
Pig iron do.	18,510	19,323	22,000 e/	21,169	22,344 2/
Ferroalloys:					
Ferromanganese	94,893	85,867	100,630	120,020	118,798 2/
Ferrosilicon	18,912	18,198	55	--	--
Ferrosilicomanganese	74,173	82,582	81,996	89,023	97,785 2/
Other	--	--	2,748	3,084	3,264 2/
Total	187,978	186,647	185,429	212,127	219,847 2/
Steel, crude thousand tons	26,001	28,054	33,026	33,745	36,772 2/
Lead:					
Mine output, Pb content	12,633	13,628	7,409 r/	2,173	4,064 2/
Metal, smelter	40,554	63,000	88,000 e/	86,457	129,744 2/
Molybdenum, mine output, Mo content	144	5 r/	-- e/	2 e/	2
Silver, metal kilograms	264,746	332,791	214,583	257,498	342,986 2/
Tungsten, mine output, W content	780	247	200 e/	-- e/	--
Zinc:					
Mine output, Zn content	22,039	21,883	13,808 r/	7,122	7,747 2/
Metal, primary	254,050	253,000	272,000 e/	271,110	279,335 2/
<b>INDUSTRIAL MINERALS</b>					
Asbestos e/	1,500	2,308 2/	2,200	2,000	1,800
Barite	1,014	40	-- r/	85	80
Cement, hydraulic thousand tons	34,999	44,444	47,313	50,730	55,130 2/
Clays, kaolin	1,755,225	1,856,157	2,328,921	2,675,485	2,792,139 2/
Diatomaceous earth	91,126	76,775	67,324	82,738	81,303 2/
Feldspar	247,969	281,083 r/	321,964 r/	319,658	320,000
Fluorspar, metallurgical-grade	290	70	50	50 e/	50
Graphite, all types	76,791	8,412 r/	5,910 r/	4,300	1,938 2/
Kyanite and related materials, andalusite	14	38	30 e/	30 e/	20
Mica, all grades	5,127	7,732	7,500 e/	37,470	43,704 2/
Nitrogen, N content of ammonia	407,297	442,482	450,000 e/	460,000 e/	470,000
Salt	695,804	771,937	750,000 e/	760,000 e/	770,000
Soda ash, manufactured e/	300,000	300,000	310,000	310,000	310,000
Stone, sand and gravel:					
Limestone thousand tons	59,221	65,446	76,886	82,809	87,227 2/
Quartzite do.	1,627	1,870	2,510	2,360	2,699 2/
Sand including glass sand do.	1,354	1,266	1,117	1,452	1,718 2/
Sulfur, byproduct:					
Metallurgy do.	229	260	263 e/	250 e/	255
Petroleum do.	65	100	200 e/	200 e/	200
Total do.	294	360	463 e/	450 e/	455
Talc and related materials:					
Pyrophyllite	573,208	602,580	644,890	707,951	789,994 2/
Talc	170,563	149,862	53,923	35,340	29,364 2/

See footnotes at end of table.

TABLE 1--Continued  
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1991	1992	1993	1994	1995 e/	
<b>MINERAL FUELS AND RELATED MATERIALS</b>						
Carbon black	231,000	247,936	300,133	310,564	323,409 2/	
Coal, anthracite	thousand tons	14,850	11,135	8,845	7,438	5,670 2/
Coke e/	do.	5,600	5,600	5,800	5,700	5,700
Fuel briquets, anthracite briquets		14,996	11,069	12,000 e/	11,000 e/	13,000
Petroleum refinery products: e/						
Gasoline	thousand 42-gallon barrels	28,917 2/	30,000	38,000	37,000	38,000
Jet fuel	do.	9,700	9,700	9,800	9,800	9,800
Kerosene	do.	14,523 2/	15,000	29,000	30,000	30,000
Distillate fuel oil	do.	128,379 2/	130,000	165,000	170,000	160,000
Residual fuel oil	do.	142,443 2/	145,000	180,000	180,000	180,000
Lubricants	do.	7,500	7,500	4,200	4,000	4,000
Other	do.	18,000	19,000	17,000	18,000	19,000
Refinery fuel and losses e/	do.	4,000	4,000	4,000	4,000	4,000
Total e/	do.	353,462	360,200	447,000	452,800	444,800

e/ Estimated. r/ Revised.

1/ Table includes data available through July 23, 1996.

2/ Reported figure.

TABLE 2  
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity	
Aluminum, primary	Aluminium of Korea Ltd.	Ulsan	18	
Bismuth, metal	metric tons	Korea Tungsten Mining Co. Ltd.	Sangdong	135
Cement	Ssangyong Cement Industrial Co. Ltd.	Yongwol	11,500	
Copper, metal	LG Metals Corp.	Changhang	50	
do.	do.	Onsan	175	
Graphite	Kaerion Graphite Ltd.	Kangwon	25	
do.	Wolmyong Mining Co.	do.	26	
Lead, metal	LG Metals Corp.	Changhang	15 1/	
do.	Korea Zinc Co. Ltd.	Onsan	100	
Nickel, metal	Korea Nickel Corp.	do.	12	
Steel	Pohang Iron and Steel Co. Ltd. (35% government owned)	Kwangyang	11,400	
do.	do.	Pohang	9,400	
Talc	Dongyang Talc Mining Co.	Chungju	NA	
Tungsten, in ore	Korea Tungsten Mining Co. Ltd.	Sangdong	3 2/	
Zinc, metal	Korea Zinc Co. Ltd.	Onsan	200	
do.	Youngpoong Corp.	Sukpo	80	

NA Not available.

1/ Closed in 1990.

2/ Closed in 1992.