USGS
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2005 Minerals Yearbook

GYPSUM

U.S. Department of the Interior
U.S. Geological Survey

February 2007

GYPSUM

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Production of crude gypsum in the United States increased by 23% to 21.1 million metric tons (Mt), and its value increased by 28% to $158 million in 2005 compared with 17.2 Mt valued at $124 million in 2004 (table 1). The United States remained the world's leading producer and consumer of gypsum. Calcined gypsum production decreased by 9% to 21.0 Mt in 2005 compared with 23.2 Mt produced in 2004. Though the exact tonnages were not known by this report's publication date, preliminary figures indicate the use of synthetic gypsum increased by 4% to 9.40 Mt in 2005 from 9.04 Mt in 2004. The use of synthetic gypsum from flue gas desulfurization (FGD) is expected to continue to increase as more coal-fired electric powerplants convert their desulfurization processes to produce marketable gypsum and as more wallboard plants are constructed near these powerplants. Most coal-burning powerplants in the United States are required by U.S. Environmental Protection Agency mandates to install sulfur dioxide removal systems within the next few years, and this has created a significant potential source of gypsum.

Domestic Data Coverage

Gypsum industry data for this report are collected by the U.S. Geological Survey (USGS) from semiannual and annual surveys of gypsum operations and from monthly statistics provided by the Gypsum Association in Washington, DC. In 2005, the USGS annual survey canvassed 107 gypsum production operations that accounted for all known domestic output (figure 1). Ninety-two of the operations canvassed responded. Of the 15 operations that did not respond, 5 were idle or shut down, and production data from the Gypsum Association accounted for 7 more operations. Thus, data are available for 99 out of 102 (97%) of current operations, representing 98% of known production. The output of the producers who did not respond to the survey was determined from public company reports or was estimated from prior year survey responses.

Description and Terminology

Pure gypsum is a white-to-transparent mineral, though impurities can give the mineral a gray, brown, or pink coloration. Its chemical name is calcium sulfate dihydrate, and its chemical formula is $CaSO_4 \bullet 2H_2O$. When gypsum is heated, it loses approximately three-quarters of its water and becomes hemihydrate gypsum ($CaSO_4 \bullet ½H_2O$), or calcined gypsum, which is soft and can easily be ground to a powder called hemihydrate gypsum plaster or plaster of paris. If the powder is mixed with water to form a slurry or paste, it will dry and set rock hard. As the plaster and water mixture dries, water will chemically recombine with the hemihydrate gypsum, and the material will revert back to the original composition of gypsum. While the hemihydrate gypsum plaster is in slurry form, it can be poured between two paper and adhesive layers to make wallboard, poured into molds, or used to fill cracks and crevices. Gypsum makes an ideal building material because it is abundant, economical, fire resistant, strong, and versatile. It can also reduce the transmission of sound and its use can have other environmental benefits, such as reducing waste delivered to landfills.

Gypsum has been known for centuries as a building material. The earliest known use of gypsum as a building material was in Anatolia around 6000 B.C. Gypsum has been found on surfaces within the great pyramids in Egypt, which were erected in about 3700 B.C. Gypsum is found on every continent in the world and is one of the most widely used minerals. Gypsum mines are located all across North America, and some Western States contain large deposits of powdery gypsum rock (figure 1).

Synthetic gypsum is generated as a byproduct of industrial processes. In the United States, the most common source of synthetic gypsum is FGD systems used to reduce sulfur dioxide emissions from coal-fired electric powerplants. These FGD systems not only keep the air clean but they also can provide a sustainable, ecologically sound source of very pure gypsum. Synthetic gypsum also is generated by various other acid-neutralizing processes.

In the United States, most gypsum is used to manufacture wallboard and plaster for homes, offices, and commercial buildings. An average new American home of 2,000-square-foot floor area uses approximately 7.31 metric tons (t) of gypsum in more than 571 square meters (6,144 square feet) of gypsum wallboard (Mineral Information Institute, 2001). Worldwide, about 51% of total gypsum consumed is used in portland cement. Gypsum is also extensively used as a soil conditioner on large tracts of land in suburban areas and in agricultural regions. As a filler in food products, the average person eats about 28 pounds of gypsum in a lifetime (National Gypsum Company, 2005a§[1]).

Production

The United States continued to lead the world in gypsum production in 2005, accounting for about 17.9% of reported global output (table 8). During 2005, domestic output of crude gypsum increased by 23% to about 21.1 Mt valued at $158 million from that of 2004 (table 1). Crude gypsum was mined by 18 companies in the United States at 45 mines in 14 States (figure 1). More than 87% of the crude gypsum produced was mined by 9 companies at 33 facilities in 14 States. The top gypsum producing States in 2005 were, in descending order of tonnage, Oklahoma, Iowa, Nevada, New York, California,

[1]References that include a section mark (§) can be found in the Internet References Cited section.

Arkansas, Texas, Indiana, and Michigan. These 9 States with 36 mines produced more than 1 Mt each and together accounted for 17.7 Mt or 84% of the total domestic output of gypsum.

The U.S. gypsum industry consisted primarily of a few large, vertically integrated companies that mined gypsum and manufactured wallboard, plaster, and other gypsum products. Companies with the most mines in 2005 were U.S. Gypsum Corporation (USG) with nine mines; Georgia-Pacific Corporation (GPC) and National Gypsum Company (NGC) each with seven mines; BPB America Inc. (BPB) with five mines; and Harrison Gypsum Company and American Gypsum Company (a subsidiary of the Eagle Materials Corporation) each with three mines. These six companies produced almost 70% of the total U.S. crude gypsum. The 10 leading gypsum mines in the United States accounted for 43% of domestic output in 2005. These 10 mines were owned by 5 companies, and their average output was about 900,000 metric tons per year (t/yr).

During 2005, gypsum was calcined (partially dehydrated by heating) at 58 plants operated by 9 companies in 29 States, principally to produce feedstock for wallboard and plaster manufacturing plants (figure 1). The leading gypsum calcining States in 2005 were, in descending order, Iowa, California, Texas, Nevada, Indiana, Arkansas, and Florida (table 3). These 7 States with 24 plants produced more than 1 Mt of calcined gypsum each and together accounted for about 56% of national output. In 2005, domestic output of calcined gypsum decreased by 9% to 21.0 Mt valued at more than $425 million (table 1).

Companies with the most calcining plants were USG with 21 plants; NGC, 17 plants; GPC, 12 plants; and BPB, 4 plants. These four companies produced more than 91% of the national calcined gypsum output. The 10 leading calcining plants in the United States accounted for more than 35% of production in 2005. These plants were owned by four companies, and the average output of the plants was 738,000 t/yr.

In addition to mined gypsum production, synthetic gypsum was generated as a byproduct of various industrial processes. The primary source of synthetic gypsum was FGD from coal-fired electric powerplants. Eighteen domestic coal-fired powerplants sold synthetic gypsum to the wallboard industry in 2005. Smaller amounts of synthetic gypsum were derived as a byproduct of chemical processes, such as acid neutralization processes, citric acid production, sugar production from sugar beets, and titanium dioxide production. Synthetic gypsum was used as a substitute for mined gypsum, principally for wallboard manufacturing, cement production, and agricultural purposes. In response to USGS surveys, five companies with six operations in six States reported that 285,000 t of synthetic gypsum valued at $1.97 million was produced as a byproduct of processes at their mines and plants and was sold in 2005. In addition to these companies, domestic coal-fired electric powerplants generated approximately 11 Mt of synthetic gypsum from their FGD systems during 2005 (American Coal Ash Association, 2005§). Of the synthetic gypsum generated by domestic coal-fired electric utility FGD systems, 8.4 Mt or 77% was used in 2005 compared with 76% in 2004. Of the total 8.7 Mt of synthetic gypsum consumed during the year, 90% was used for wallboard production, 8% was used in cement and concrete manufacture, and 2% was used in agricultural applications.

Phosphogypsum, another industrial byproduct, is produced in the manufacturing of fertilizers. At present, phosphogypsum is not used in wallboard manufacturing because of the presence of radionuclides, which produce radioactive radon gas as they decay.

The United States gypsum board industry achieved its highest rate of annual shipments ever in calendar year 2005 when U.S. manufacturers of gypsum board shipped a total of 3.36 billion square meters (36.2 billion square feet) of material. This volume represents a 6% increase in shipments compared with the same 12-month period of 2004 when 3.17 billion square meters (34.3 billion square feet) of board was shipped. The 2005 figure represents the fifth consecutive year of increased shipments for the U.S. gypsum board manufacturing industry (Gypsum Today, 2006§).

During 2005, 8 companies manufactured gypsum wallboard products at 77 plants in the United States (figure 2). Wallboard product shipments in 2005 were approximately 2.67 billion square meters (28.7 billion square feet), a decrease of about 7% compared with those of 2004 (table 5). This represented about 77% of the total domestic wallboard products production capacity. The decline was probably the result of temporary plant closings in the Gulf Coast region because of severe hurricanes and flooding. No new wallboard plants were completed in 2005. New plant construction and plant expansions, however, were in progress during the year.

BPB announced plans to build wallboard plants in North Carolina and West Virginia that will use FGD gypsum (Global Gypsum Magazine, 2005a). These plants will each have a capacity of 65 million square meters per year (700 million square feet per year). Lafarge North America Inc. (LaFargeNA) continued upgrading the wallboard plant in Westchester County, NY, by adding a second line. The plant was expected to have the capacity to produce 60 million square meters per year (650 million square feet per year) of wallboard at the completion of expansion in late 2006. Lafarge also planned to expand the Silver Grove, KY, plant (Lafarge Group, 2005a). National Gypsum announced plans to build a high-speed wallboard plant near Charlotte, NC, capable of producing 70 million square meters per year (750 million square feet per year), that will use FGD gypsum generated by Duke Power Company (National Gypsum Company, 2005b§). American Gypsum Company planned to build a new high-speed gypsum wallboard plant using synthetic gypsum under a long-term supply agreement with the South Carolina Public Service Authority, known as Santee Cooper, South Carolina's State-owned electric and water utility, near Georgetown, SC (Eagle Materials Inc., 2005§). This new plant was designed to produce 70 million square meters per year (750 million square feet per year), and construction was expected to begin in late 2005. USG planned to expand the Norfolk, VA, plant (Gypsum Today, 2005§). The combined production of these new wallboard plants and expansions should increase capacity by almost 0.53 billion square meters per year (5.7 billion square feet per year) by 2009, resulting in a 15% increase and raising total wallboard production capacity to about 4.1 billion square meters per year (44.1 billion square feet per year).

There were some major changes in the structure of the gypsum industry in 2005. Cie de Saint-Gobain SA, Europe's leading distributor of building materials, agreed to buy BPB, making Cie de Saint-Gobain SA the world's leading wallboard

supplier. Also in 2005, Koch Industries, Inc. finalized the purchase of GPC.

Consumption

In 2005 U.S. apparent domestic consumption was more than 41.5 Mt, a 14.7% increase compared with that of 2004. Domestic sources (mined crude plus an estimated 9.4 Mt of synthetic gypsum produced) met more than 73% of domestic consumption requirements; imports satisfied the remaining needs. In 2005, slightly more than 23% of the gypsum consumed in the United States came from synthetic sources, about the same as in 2004.

Gypsum output is categorized as either calcined or uncalcined (table 4). Calcined gypsum was produced domestically from crude gypsum to manufacture wallboard and plaster products. Uncalcined gypsum, used for portland cement production and agriculture, accounted for virtually all remaining consumption during the year. Miscellaneous uses, such as athletic field markings, accounted for only a fraction of 1% of consumption.

In 2005, slightly more than 46% of the calcined gypsum used to manufacture wallboard was consumed in the production of regular ½-inch gypsum board (table 5). Type-X gypsum board, so named because of extra fire retardation qualities, consumed 27% of calcined gypsum. Other regular gypsum board, from ¼- to 1-inch thick, consumed 15%. Fire-resistant wallboard, mobile-home wallboard, water- and moisture-resistant wallboard, lath, veneer base, and sheathing composed most of the balance. Metropolitan areas in the South Atlantic, Pacific, East North Central, and West South Central regions (in decreasing order) were the leading sales areas for gypsum wallboard products.

During 2005, nearly 2.75 Mt, about 70%, of the uncalcined gypsum consumed in the United States was for portland cement production (table 4). Gypsum is added to cement to retard its setting time and makes up about 2% to 6% by weight of cement output (Roskill Information Services Ltd., 2004, p. 294). The remainder of the uncalcined gypsum consumed is used primarily in agriculture. Finely ground gypsum rock was used in agriculture and other industries to neutralize acidic soils, to improve soil permeability, to add nutrients, to stabilize slopes, and to provide catalytic support for maximum fertilizer benefits. Small amounts of high-purity gypsum are also used in a wide range of industrial applications, including the production of foods, glass, paper, and pharmaceuticals.

Recycling

Several million tons of gypsum waste is generated every year by wallboard manufacturing, wallboard installation, and building demolition. Only a small portion of this waste has been recycled in the past, but in 2005, two wallboard manufacturers in the United States entered into new agreements to purchase recycled gypsum from wallboard waste from construction sites (Gypsum Recycling International A/S, 2005§). Initially this will not affect gypsum supplies much, but as more and more waste is generated and room in landfills runs out, recycling could increase.

Gypsum waste generated by the wallboard manufacturing process can be recycled easily. The gypsum core and paper covering are disaggregated and fed back into the raw material stream along with new material. Between 10% and 12% of the wallboard used in new construction and renovation winds up as wallboard scrap. The costs of disposal of this wallboard scrap in solid waste landfills are increasing. In addition to recycling scrap in wallboard plants, wallboard scrap may also be ground and used as a soil conditioner. Wallboard manufacturers and the construction industry have been exploring ways to return this scrap and waste to a plant for recycling. Other potential markets for recycled gypsum waste are in cement production, as a stucco additive, in sludge drying, in water treatment, in grease absorption, and for marking athletic fields.

Prices

In 2005, the average values (free on board, mine or plant) reported by U.S. producers were $7.48 per metric ton for crude gypsum and $20.26 per ton for calcined gypsum (table 4). The average value for plaster reported by domestic producers during the year was $16.66 per 100 kilograms ($7.56 per 100 pounds). The average value of uncalcined gypsum used in agriculture and in cement production was about $17.89 per ton.

During 2005, prices for gypsum wallboard generally increased in response to increased demand. Prices for regular ½-inch wallboard rose in 17 of the 19 major U.S. metropolitan areas that were sampled. Wallboard prices decreased slightly in 2 of the 19 cities. The average wallboard price for 2005 in these 19 cities was $271.44 per 100 square meters ($252.16 per 1,000 square feet). The changes in prices for each metropolitan area ranged from a decrease of $26.95 per 100 square meters ($25.00 per 1,000 square feet) in Pittsburgh, PA, to an increase of $140.14 per 100 square meters ($130.00 per 1,000 square feet) in Cincinnati, OH. At the beginning of the year, prices in these 19 cities ranged during the 12 months beginning in January of 2005 from $172 to $421 per 100 square meters ($160 to $391 per 1,000 square feet). The average of the prices in these 19 cities was $255.83 per 100 square meters ($237.32 per 1,000 square feet) in January and $309.40 per 100 square meters ($287.01 per 1,000 square feet) at yearend. This represented an overall average increase in price of $32.02 per 100 square meters ($29.70 per 1,000 square feet), or 13%, from beginning to yearend 2005 (Engineering News-Record, 2005a, b).

Foreign Trade

In 2005, the United States was the world leader in international trade of gypsum and gypsum products (tables 6, 7). The United States imported crude gypsum from 18 countries and exported gypsum and gypsum products to 69 countries and territories in 2005. Only a small amount of crude gypsum and other gypsum products was exported by the United States in 2005, most of which went to Canada.

Net imports of crude gypsum in 2005 increased by 10% from those of 2004 and accounted for 27% of apparent consumption. Much of this import dependence can be attributed to the lack of adequate domestic gypsum resources near large east and west

coast wallboard markets. Canada and Mexico accounted for 91% of imported gypsum, while Spain, the Dominican Republic, China, and Jamaica (in descending order) supplied most of the remainder (table 6). Most imports from Canada went to east coast plants, and Mexican sources chiefly served the west coast. Foreign subsidiaries of U.S. gypsum companies produced much of the gypsum that was imported for the wallboard plants. Most of the crude gypsum imported by the United States from Mexico was produced by Compania Minera Caopas de CV and Compania Occidental Mexicana SA de CV (COMSA) in Baja California (Sharpe, 2006). Almost all gypsum imported from Canada came from Nova Scotia. Smaller amounts of imported gypsum were used in portland cement production. The completion of large wallboard manufacturing plants near powerplants along the east coast may affect gypsum imports in the future.

Wallboard exports rose by 3% in 2005, totaling about 9.6 million square meters (103 million square feet) valued at $59 million; they went primarily to countries in Asia, Europe, and Latin America. Wallboard imports increased by 20% in 2005 and totaled 82.3 million square meters (887 million square feet) valued at $129 million.

World Industry Structure

In 2005, 89 countries produced gypsum, 10 of which accounted for 76% of the total world production (table 8). Global natural gypsum production in 2005 was estimated to be 118 Mt, an increase of 3% compared with 2004. More than 200 million metric tons per year of synthetic gypsum (mostly phosphogypsum) is generated worldwide (Roskill Information Services Ltd., 2004, p. 20). However, only a small portion of that gypsum is consumed. North American production accounted for almost 32% of total crude gypsum production. The high demand for gypsum in the United States by the domestic construction industry, which consumes more than one-quarter of total world crude gypsum production, was not matched abroad. This trend may change as European and Asian markets begin to incorporate wallboard in their building styles. The estimate for world production is probably lower than actual production because output that is used by gypsum producers in some countries to make other products onsite is not reported. Additionally, production from small deposits in developing nations was intermittent and in many cases unreported.

Worldwide, the leading use of gypsum is in the manufacture of cement and concrete. In 2004 (the last year worldwide consumption use was available), cement manufacture accounted for about 51% of worldwide gypsum consumption while plaster products, including wallboard, accounted for 39% of all consumption. As a low-value, high-bulk commodity drawn from deposits widely distributed throughout the world, gypsum tended to be consumed within the many countries that mine it. Less than 20% of the world's crude gypsum production was estimated to enter international trade. Only a few countries, such as Canada, Mexico, Spain, and Thailand, were major crude gypsum exporters; of these, Canada and Mexico are significant gypsum exporters because of their large deposits in proximity to large wallboard markets in the United States. Little crude gypsum was exported from the United States.

Although use of gypsum wallboard increased worldwide, only industrialized nations, such as the United States, used gypsum primarily for wallboard products. In developing countries, especially in the Middle East and Asia, most gypsum was used in the production of cement or as a plaster product.

Estimated world production capacity for gypsum wallboard in 2005 exceeded 7.8 billion square meters per year (about 84 billion square feet per year) at more than 250 plants worldwide. Almost one-half of this capacity was in the United States; Asia and Western Europe each accounted for about one-fifth. Construction or expansion of dozens of wallboard plants was underway during the year in many countries, and as in the United States, the use of synthetic gypsum by other industrialized nations increased.

Globally, 2005 marked the commencement of construction of new gypsum facilities and wallboard plants as well as the planning of additional facilities. More and more construction companies worldwide have recognized the economy and convenience of using gypsum board products.

World Review

Asia.—BPB announced plans to expand the wallboard plant in Thailand by adding a second wallboard manufacturing line and to begin construction of a plant in Malaysia that is expected to begin operations by early 2006 (Sharpe, 2006). BPB also announced plans to expand plasterboard capacity in China (Global Gypsum Magazine, 2005e).

The Lafarge Group announced that Lafarge Boral Gypsum in Asia (LBGA) planned to double capacity in China with the Chongqing and the Shanghai plants slated to become operational in 2006. Lafarge also announced construction plans for facilities in the Republic of Korea and Vietnam (Lafarge Group, 2005b, c).

Australia.—Boral Australian Gypsum, Ltd. announced plans to expand the capacity of its wallboard plant in Brisbane, Queensland to 20 million square meters (215.3 million square feet) (Sharpe, 2006).

Canada.—In 2005, Canada continued to be the second ranked North American producer of gypsum. Canadian production totaled 9.4 Mt in 2005, slightly more than in 2004. About 7.7 Mt or 82% of Canadian production was exported to the United States. Two Canadian companies announced that they will open wallboard plants in Nova Scotia and New Brunswick to supply markets in eastern Canada and the New England States in the United States (Sharpe, 2006).

Europe.—In 2005, KnaufGips KG (Knauf) negotiated the use of FGD gypsum from two state-owned coal-fired powerplants in Bulgaria (Global Gypsum Magazine, 2005b). Knauf invested in expanding the capacity of one of its plants in the United Kingdom (Sharpe, 2006). Knauf also began construction of a wallboard plant in St. Petersburg and announced construction of a plant in the Irkutsk region (Sharpe, 2006). Lafarge and BPB also announced plans to construct and upgrade wallboard plants in the United Kingdom (Lafarge Group, 2005b; Sharpe, 2006). BPB announced plans to expand wallboard capacity in France (BPB America Inc., 2005b§). BPB and Lafarge both began construction of wallboard plants in Romania, which were expected to begin production in late 2005 or 2006 (Sharpe, 2006).

India.—BPB Indian Gypsum commissioned its third plant in India and announced that it is to construct a fourth Indian plasterboard plant to be ready by mid-2007 (BPB America Inc., 2005b§; Global Gypsum Magazine, 2005c).

Mexico.—Lafarge announced that it will team up with Consorcio Comex SA de CV (Comex) to build a new gypsum production plant in Querearo State (Global Gypsum Magazine, 2005d). BPB and USG also announced plans for wallboard plants in Mexico (Sharpe, 2006). When these plants are complete, there will be five wallboard plants operating in Mexico to meet the rising local demand.

Middle East and Africa.—BPB BPB announced plans for construction of plants in Egypt, South Africa, and Turkey (Harder, 2006). In Saudi Arabia, Lafarge and the United Gypsum Company announced plans for new wallboard plants (Global Gypsum Magazine, 2005f, g). Lafarge also announced plans for a plant in Algeria (Global Gypsum Magazine, 2005d).

South America.—Colombian sources said Etex Group and Lafarge will partner in building a gypsum plasterboard plant in northern Colombia that will be the largest plant of its kind in the Andean region (Global Gypsum Magazine, 2005g).

Outlook

Demand for gypsum products was expected to increase at a rate of 1% to 3% per year through 2010 to about 50 Mt (National Association of Home Builders, 2006§). Unit value was also expected to increase by about 4% per year through 2010. Demand for wallboard was expected to advance to 3.8 billion square meters (41 billion square feet) by 2009.

One of the key economic indicators used by the wallboard and gypsum industry is the number of new housing starts. The residential market is responsible for about 60% of consumption of gypsum products. Housing starts in North America were expected to drop slightly in 2006 and to continue to decrease slightly into 2007 if interest rates rise as expected (National Association of Home Builders, 2006§). Preliminary gypsum production and consumption data for the first part of 2006 suggest that use levels in 2006 will match those of 2005. Drops in housing starts were expected to be offset by remodeling and industrial construction. Other supply-and-demand indicators, such as construction rates for new office and commercial buildings and the continuing trend to construct larger homes with more rooms, also suggest that the gypsum industry will be close to the same level as in 2005.

The availability of more FGD gypsum will continue to increase as scrubbers come online at more and more coal-fired electric powerplants (U.S. Environmental Protection Agency, 2003§). During the next several years, the use of mined gypsum may decline in the United States as greater quantities of synthetic gypsum are used in wallboard manufacturing. Some actual and planned gypsum mine closings already have been attributed to substitution by synthetic gypsum. This rate of substitution could accelerate additional mine closings during the rest of this decade. However, only those FGD plants that are near enough to wallboard plants to have a transportation advantage will be able to have their gypsum output used in the near future. The percentage of synthetic gypsum use may eventually reach an economic equilibrium point. In the long term, as disposal areas fill and opening new disposal sites becomes more difficult, power companies may have to calcine and clean the gypsum waste slurry that they produce and may even have to subsidize transportation costs to rid themselves of excess gypsum waste. This may increase the economic viability of using FGD gypsum from powerplants that may have been considered too far from wallboard plants in the past.

Expansion of synthetic gypsum resources will continue in Europe and North America, but would be limited by the diminishing number of coal-fired electric powerplants without FGD systems. Most domestic powerplants built in recent years have been natural-gas fired. The trend towards using FGD gypsum as a raw material at the expense of natural gypsum is set to continue as air pollution regulations spread across the globe to include developing nations. In Europe, 16 Mt of FGD gypsum was produced, and there were 74 gypsum factories using FGD gypsum as a raw material (Slatten, 2005).

The U.S. gypsum industry has been moving toward the use of large-capacity wallboard plants supplied from multiple sources, including synthetic gypsum from coal-fired powerplants. These larger wallboard plants have been located in regions of high population and growth, which are the areas of highest consumption. The older, less efficient and smaller, natural (mined) gypsum-fed plants will find it increasingly difficult to compete, and some will close (Harris, 2001).

As a response to increased public awareness, the gypsum industry probably will increase its recycling of scrap materials into raw materials streams. There also will be an increase in the use of ecolabels, such as the Scientific Certification System Green Cross, which certifies there is recycled and recovered content in each product. Implementation of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, Public Law 109-59 (SAFETEA-LU), which was passed by congress and signed by the President in August of 2005, will continue funding for the building and repair of the Nation's highway system through 2009 (U.S. Department of Transportation, Federal Highway Administration, 2006§). This will be an important stimulus for the domestic cement industry and, thus, will increase the demand for gypsum as an integral component of cement.

Industry trends also indicate significant developments abroad in the coming decade. For example, the pace and magnitude of wallboard plant construction in Asia, particularly China and Thailand, indicated that this region, with billions of potential consumers, could become one of the world's leading gypsum wallboard markets. The gypsum market in Japan will probably also grow at increasing rates. Future demand in emerging Asian markets is likely to be an important factor in gypsum sector growth (Industrial Minerals, 2004).

Elsewhere, wallboard production capacity growth and the recognition of the convenience and economy of wallboard as a building material in Central America, Europe, India, and South America suggests that wallboard manufacturing will require increased production of gypsum in the future.

References Cited

Engineering News-Record, 2005a, Construction economics: Engineering News-Record, v. 254, no. 3, January 24, p. 24-25.

Engineering News-Record, 2005b, Construction economics: Engineering News-Record, v. 255, no. 24, December 19, p. 21-22.
Global Gypsum Magazine, 2005a, NEWS, and so does BPB (again): Global Gypsum Magazine, April, p. 4.
Global Gypsum Magazine, 2005b, NEWS, Knauf helps with FGD problem: Global Gypsum Magazine, April, p. 6.
Global Gypsum Magazine, 2005c, NEWS in brief, India: Global Gypsum Magazine, June-July, p. 5.
Global Gypsum Magazine, 2005d, NEWS, Lafarge gypsum 'goes large' on gypsum: Global Gypsum Magazine, June-July, p. 4.
Global Gypsum Magazine, 2005e, New China plant for BPB: Global Gypsum Magazine, October, p. 6.
Global Gypsum Magazine, 2005f, NEWS in brief…: Global Gypsum Magazine, October, p. 6.
Global Gypsum Magazine, 2005g, NEWS in brief…: Global Gypsum Magazine, December, p. 8.
Harder, Joe, 2006, The global gypsum board industry: Global Gypsum Magazine, January–February, p. 18-25.
Harris, Paul, 2001, Wallboard wonderland—The North American gypsum market: Industrial Minerals, no. 400, January, p. 28-37.
Industrial Minerals, 2004, Russian gypsum germination: Industrial Minerals, no. 435, December, p. 58-59.
Lafarge Group, 2005a, Lafarge announces the expansion of Silver Grove gypsum drywall plant, Kentucky, USA: Paris, France, Lafarge Group press release, November 7, 1 p.
Lafarge Group, 2005b, Lafarge Boral Gypsum in Asia invests in Vietnam: Paris, France, Lafarge Group press release, November 22, 2 p.
Lafarge Group, 2005c, Lafarge Boral Gypsum in Asia (LBGA) to double its capacity in China: Paris, France, Lafarge Group press release, February 8, 2 p.
Mineral Information Institute, 2001, Look around…Everything is made from something: Denver, CO, Mineral Information Institute poster, 1 p.
Roskill Information Services Ltd., 2004, The economics of gypsum and anhydrite (9th ed.): London, United Kingdom, Roskill Information Services Ltd., 342 p.
Sharpe, R.D., 2006, Gypsum: Mining Engineering, v. 58, no. 6, June, p. 33-35.
Slatten, Bruce, 2005, Trends in the European gypsum Industry: Global Gypsum Magazine, October, p. 14-18.

Internet References Cited

American Coal Ash Association, 2004, Acaa annual CCP survey, accessed August 18, 2005, at URL http://www.acaa-usa.org/2004_CCP_Survey(9-9-05).
BPB America Inc., 2005a (September 8), BPB to expand French plasterboard capacity, accessed August 18, 2005, via URL http://www.bpb.com/content-596.
BPB America Inc., 2005b (October 20), BPB announces fourth Indian plasterboard plant, accessed November 3, 2005, via URL http://www.bpb.com/content-21.
Eagle Materials Inc., 2005 (April 1), Eagle Materials Inc. announces plans for a new gypsum wallboard plant in South Carolina, accessed August 18, 2005, at URL http://ir.eaglematerials.com/ReleaseDetail.cfm?ReleaseID=159040.
Gypsum Recycling International A/S, 2005 (January 19), GRI chosen as recycling partner, accessed August 18, 2005, at URL http://www.gypsumrecycling.biz/?Side=5955&Udvid=1.
Gypsum Today, 2005 (February 2), USG to add 480mmsf at Norfolk VA plant by end of '06, accessed March 2, 2005, at URL http://www.gypsumtoday.com/news/viewnews.pl/id=482.
Gypsum Today, 2006 (January 18), Gypsum Association reports wallboard record for 2005, accessed June 20, 2006, at URL http://www.gypsumtoday.com/news/viewnews.pl/id=702.
National Association of Home Builders, 2006, Housing and interest rate forecast, accessed July 20, 2006, at URL http://www.nahb.org/generic.aspx?sectionID=138&genericContentID=631.
National Gypsum Company, 2005a, Gypsum rock—The raw material, accessed June 20, 2006, at URL http://www.nationalgypsum.com/about/company_info/gypmaterial.html.
National Gypsum Company, 2005b, National Gypsum to build plant in North Carolina, accessed June 20, 2006, at URL http://www.nationalgypsum.com/about/news/2005/news168.
U.S. Department of Transportation, Federal Highway Administration, 2006, The Safe, Accountable, Flexible , Efficient Transportation Equity Act: A Legacy for Users, Public Law 109-59, accessed September 18, 2006, at URL http://www.fhwa.dot.gov/safetealu/index.htm.
U.S. Environmental Protection Agency, 2003, Basic information, Clear Skies, accessed August 18, 2005, at URL http://www.epa.gov/air/clearskies/basic.html.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Coal Combustion Products. Ch. in Minerals Yearbook, annual (1994-2000).
Evaporites and brines. Ch. in United States Mineral Resources, Professional Paper 820, 1973.
Gypsum. Ch. in Mineral Commodity Summaries, annual.
Gypsum. Mineral Industry Surveys, monthly.
Gypsum Deposits of the United States, Bulletin 697, 1920.

Other

Gypsum. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.
Gypsum Association.

TABLE 1
SALIENT GYPSUM STATISTICS[1]

(Thousand metric tons and thousand dollars)

	2001	2002	2003	2004	2005
United States:					
Crude:					
Production:					
Quantity	16,300	15,700	16,700	17,200	21,100
Value	119,000	108,000	114,000	124,000	158,000
Imports for consumption	8,270	7,970	8,300	10,100	11,200
Synthetic gypsum sales	6,820	9,900	8,300	8,400 r	8,690
Calcined:					
Production:					
Quantity	19,100	18,600	20,400	23,200	21,000
Value	352,000	372,000	400,000	489,000	426,000
Products sold, value	2,470,000	2,690,000	2,880,000	3,160,000	3,480,000
Exports, value	96,400	102,000	111,000	127,000	142,000
Imports for consumption, value	231,000	196,000	184,000	231,000	288,000
World, production	105,000	107,000 r	110,000 r	112,000 r	118,000 e

eEstimated. rRevised.

[1]Data are rounded to no more three significant digits.

TABLE 2
CRUDE GYPSUM MINED IN THE UNITED STATES, BY STATE[1]

	2004			2005		
State	Active mines	Quantity (thousand metric tons)	Value (thousands)	Active mines	Quantity (thousand metric tons)	Value (thousands)
Arizona and New Mexico	4	619	$4,340	5	701	$5,300
Arkansas, Kansas, Louisiana	4	2,250	23,100	6	3,400	34,200
California, Nevada, Utah	10	4,170	22,100	11	4,690	29,900
Colorado, South Dakota, Wyoming	5	934	6,420	4	1,080	7,750
Indiana, New York, Ohio, Virginia	2	1,150	8,000	3	3,430	19,800
Iowa	6	1,920	14,600	5	2,610	20,100
Michigan	2	452	5,660	3	1,050	10,700
Oklahoma	5	3,250	20,800	4	2,620	18,400
Texas	6	2,450	18,800	4	1,540	11,800
Total	44	17,200	124,000	45	21,100	158,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
CALCINED GYPSUM PRODUCED IN THE UNITED STATES, BY STATE[1]

State	2004 Active plants	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Active plants	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Alabama	1	554	$15,800	1	518	$17,400
Arizona, Colorado, New Mexico, Utah	3	849	11,200	3	831	9,860
Arkansas, Louisiana, Oklahoma	6	2,950	52,800	5	1,770	30,200
California	7	2,510	51,400	5	2,220	45,300
Maryland, North Carolina, Virginia	4	1,240	32,800	3	1,010	31,400
Florida	3	1,510	36,800	3	1,260	35,000
Georgia	2	481	9,000	2	589	10,800
Illinois, Indiana, Kansas	6	2,030	39,800	6	2,170	44,300
Iowa	5	1,930	28,500	5	2,590	26,200
Massachusetts, New Hampshire, New Jersey	5	1,430	35,100	5	1,380	40,000
Michigan	4	916	16,900	3	502	12,600
Nevada	2	1,410	9,970	3	1,450	18,300
New York	3	2,130	29,200	2	752	21,700
Ohio	2	223	4,410	2	235	4,730
Oregon	1	492	14,800	1	581	18,400
Pennsylvania	1	585	13,900	1	600	14,600
Texas	5	1,470	27,300	5	1,830	34,500
Washington and Wyoming	2	487	59,000	3	737	10,500
Total	62	23,200	489,000	58	21,000	426,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 4
GYPSUM PRODUCTS (MADE FROM DOMESTIC, IMPORTED, AND SYNTHETIC GYPSUM) SOLD OR USED IN THE UNITED STATES, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Uncalcined:				
Portland cement	3,160	41,100	2,750	39,500
Agriculture and miscellaneous[2]	1,030	29,300	1,160	30,500
Total	4,180	70,500	3,920	70,000
Calcined:				
Plasters	906	143,000	892	149,000
Prefabricated products[3]	29,500	2,940,000	27,300	3,260,000
Total calcined	30,400	3,090,000	28,200	3,410,000
Grand total	34,600	3,160,000	32,100	3,480,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes synthetic gypsum.
[3]Includes weight of paper, metal, or other materials and some synthetic gypsum.

TABLE 5

PREFABRICATED GYPSUM PRODUCTS SOLD OR USED IN THE UNITED STATES[1]

Product	2004			2005		
	Quantity (thousand square feet)	Quantity[2] (thousand metric tons)	Value (thousands)	Quantity (thousand square feet)	Quantity[2] (thousand metric tons)	Value (thousands)
Lath:						
3/8-inch	967	1	$340	767	487	$229
1/2-inch	2,350	2	509	1,420	1	331
Other	9,920	10	1,610	12,300	9	1,420
Total	13,200	13	2,450	14,500	11	1,980
Veneer base	452,000	462	51,200	429,000	442	52,600
Sheathing	268,000	270	32,300	186,000	182	25,000
Regular gypsumboard:						
3/8-inch	2,070,000	2,130	121,000	687,000	636	104,000
1/2-inch	13,500,000	11,800	1,330,000	13,300,000	11,500	1,520,000
5/8-inch	2,030,000	2,200	123,000	2,110,000	2,260	135,000
1-inch	551,000	600	60,100	211,000	228	54,200
Other[3]	963,000	1,000	103,000	1,150,000	1,210	121,000
Total	19,100,000	17,700	1,740,000	17,500,000	15,800	1,940,000
Type X gypsumboard	8,100,000	8,470	809,000	7,830,000	8,130	908,000
Predecorated wallboard	157,000	157	37,000	80,200	81	12,400
5/16-inch mobile home board	374,000	378	44,100	462,000	427	50,800
Water- and moisture-resistant board	1,720,000	1,730	168,000	1,740,000	1,760	186,000
Other	301,000	312	64,000	448,000	467	89,600
Grand total	30,500,000	29,500	2,940,000	28,700,000	27,300	3,260,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes weight of paper, metal, or other materials.

[3]Includes 1/4-, 7/16-, and 3/4-inch gypsumboard.

TABLE 6
IMPORTS FOR CONSUMPTION OF CRUDE GYPSUM, BY COUNTRY[1]

(Thousand metric tons and thousand dollars)

Country	2004		2005	
	Quantity	Value	Quantity	Value
Austria	(2)	8	--	--
Bahrain	--	--	(2)	11
Brazil	--	--	17	155
Canada[3]	6,890	67,300	7,650	79,800
China	42	280	(2)	2
Costa Rica	(2)	13	--	--
Denmark	--	--	(2)	24
Dominica	--	--	(2)	13
Dominican Republic	149	1,100	166	1,290
France	(2)	6	(2)	20
Germany	2	8	(2)	50
Italy	27	37	(2)	3
Jamaica	40	538	64	434
Japan	(2)	6	--	--
Jordan	--	--	(2)	2
Mexico	2,250	20,000	2,500	21,500
Morocco	--	--	(2)	2
Netherlands	(2)	8	--	--
Peru	(2)	46	(2)	8
South Africa	7	672	--	--
Spain	728	7,250	782	10,600
Sweden	--	--	(2)	42
United Kingdom	(2)	20	(2)	9
Total	10,100	97,300	11,200	114,000

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

[3]Includes anhydrite.

Source: U.S. Census Bureau.

TABLE 7
U.S. GYPSUM AND GYPSUM PRODUCTS TRADE FOREIGN[1]

(Thousand metric tons and thousand dollars)

Year	Crude[2]		Plasters[3]		Boards[4]		Other, value[5]	Total, value
	Quantity	Value	Quantity	Value	Quantity	Value		
Exports:								
2004	149	15,000	332	31,800	83	51,100	29,300	127,000
2005	148	16,400	174	33,700	86	58,900	33,000	142,000
Imports for consumption:								
2004	10,100	97,200	5	3,420	617	87,100	43,200	231,000
2005	11,200	114,000	6	4,350	739	129,000	41,100	288,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Data are for "Gypsum, anhydrite," Harmonized Tariff Schedule of the United States (HTS) code 2520.10.0000.

[3]Data are for "Plasters," HTS code 2520.20.0000.

[4]Data are for "Boards, sheets, panels, tiles, and similar articles, not ornamented—Faced or reinforced with paper or paperboard only," HTS code 6809.11.0000.

[5]Data are for "Boards, sheets, panels, tiles, and similar articles, not ornamented: Other," HTS code 6809.1900.00, and "Other articles," HTS code 6809.90.0000.

Source: U.S. Census Bureau.

TABLE 8
GYPSUM: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country	2001	2002	2003	2004	2005[e]
Afghanistan[e]	3	3	3	3	2
Algeria	281	322	350	1,058 [r]	1,460 [3]
Argentina	372	366 [r]	490 [r]	673 [r]	700
Australia[e]	3,800	4,000	4,000	4,000	4,000
Austria[e, 4]	1,000	1,000	1,000	1,000	1,000
Azerbaijan[e]	1	1	4 [3]	4	5
Bhutan[e]	55	55	56	56	57
Bosnia and Herzegovina[e]	30	30	30	30	30
Brazil[4]	1,507	1,633 [r]	1,529 [r]	1,472 [r]	1,480 [3]
Bulgaria[4]	167	156	168	170 [e]	160
Burma	65	90	66	71 [r]	71
Canada[4]	7,821	8,809	8,376	9,339	9,400 [3]
Chile	517	610	662	630 [r]	630
China[e]	6,800	6,850	6,850	7,000	7,300
Colombia[e]	560	560	560	560	700
Croatia	131	145	166	150	150
Cuba[e]	130	130	130	130	130
Cyprus	250	295	300	255 [r]	260
Czech Republic	24	102	104	100 [e]	100
Dominican Republic	176 [r]	163	240 [r]	459 [r]	460
Ecuador	1	5	5	5 [e]	5
Egypt[e, 4]	2,000	2,000	2,000	2,000	2,000
El Salvador[e]	6	6	6	6	6
Eritrea	1	1	1	1	1
Ethiopia[4]	51	23 [r]	48	51 [r]	52
France[e, 4]	4,500	3,500	3,500	3,500	3,500
Germany, marketable[4]	1,966 [r]	1,761	1,748	1,579 [r]	1,580
Greece[e, 4]	600	500	500	500	500
Guatemala	97	81	67	106 [r]	100
Honduras	60	60	60	60 [e]	60
Hungary[e, 4]	252	72	75	75	70
India[e]	2,250	2,300	2,300	2,350	2,400
Indonesia	6	6	6	6	6
Iran[5]	10,382 [r]	13,535 [r]	13,828 [r]	12,594 [r]	13,000
Iraq[6]	NA	NA	NA	NA	NA
Ireland[e]	450	450	450	450	450
Israel	70 [r, e]	14 [r]	65 [r]	76 [r]	79
Italy[e]	1,300	1,300	1,200	1,200	1,210
Jamaica	320	165	249	283 [r]	285
Japan	5,874	5,645	5,764	5,865 [r]	5,890
Jordan	86	11	64	135 [r]	140
Kenya[4]	8	8 [r]	9 [r]	9 [r]	9
Laos	121	110	102	244 [r]	250
Latvia	125 [e]	217	159	226 [r]	220
Lebanon[e]	2	2	2	2	2
Libya[e]	150	150	150	175 [r]	175
Luxembourg[e, 4]	(7)	(7)	(7)	(7)	(7)
Macedonia[e]	20	20	20	20	20
Mali[e]	1	1	1	1	1

See footnotes at end of table.

TABLE 8—Continued
GYPSUM: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

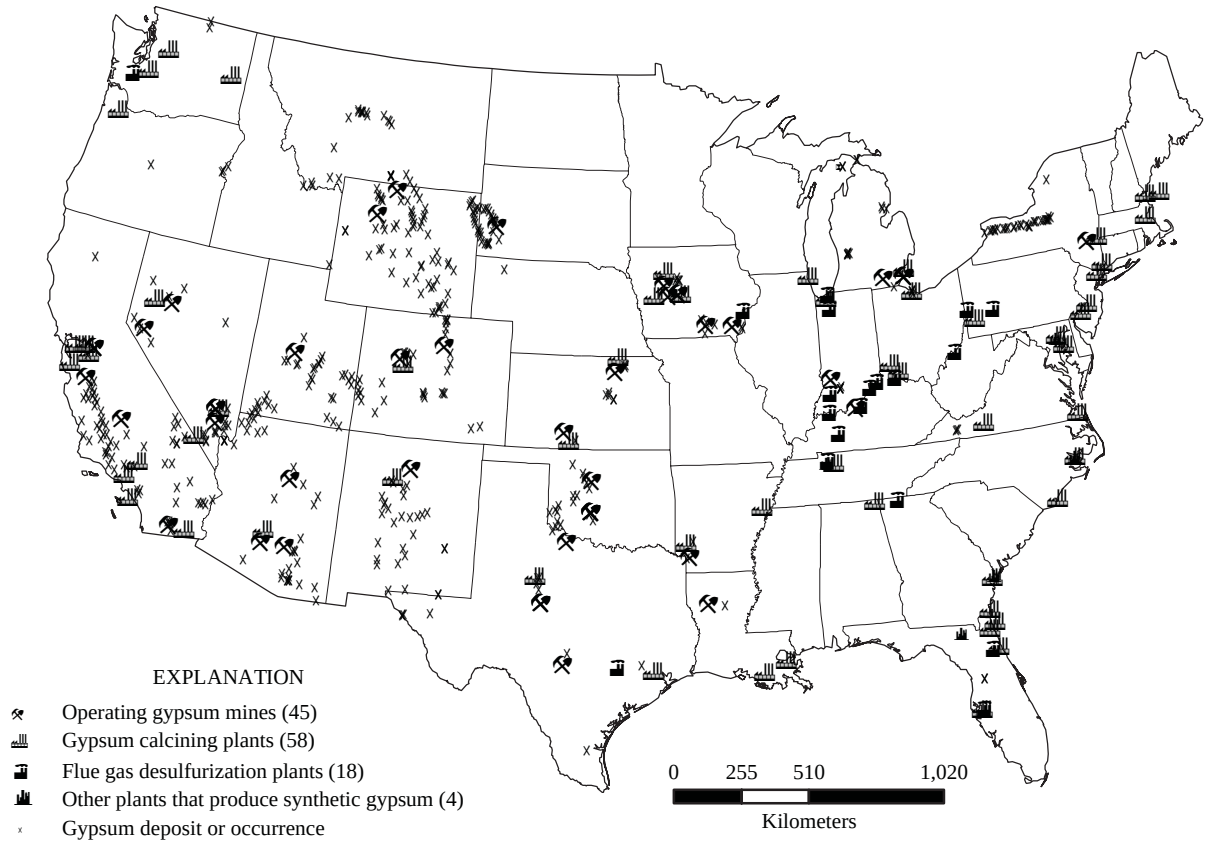
Country	2001	2002	2003	2004	2005[e]
Mauritania	100 [e]	100 [e]	34 [r]	39 [r]	39
Mexico[4]	6,237	6,740 [r]	6,986	700 [e]	7,200
Moldova[e]	32	32 [3]	32	32	32
Mongolia[e]	25	25	25	25	25
Morocco[e]	550	600	600	600	600
Nicaragua[4]	34	28	31	30 [r]	30
Niger	3	18	18	18 [e]	18
Nigeria[e]	610 [3]	300	100	100	100
Oman	44	56	50 [e]	60 [e]	60
Pakistan[e]	350	360 [3]	360	360	360
Paraguay[e]	4 [3]	4	5 [r]	5 [r]	5
Peru	21	75	71	150	150 [p]
Poland[4]	1,094	1,147	1,328	1,272	1,300
Portugal[e, 4]	500	500	500	500	500
Romania	275	421	394	350 [e]	350
Russia[e]	1,500 [r]	1,600 [r]	1,800 [r]	2,077 [r, 3]	2,200
Saudi Arabia[e]	450	450	450	450	450
Serbia and Montenegro	58	55	55	55 [e]	50
Sierra Leone[e]	4	4	4	4	4
Slovakia[4]	169	122	125	125 [e]	125
Slovenia[e]	10	10	10	10	10
Somalia	NA [r]	NA [r]	NA [r]	NA [r]	NA
South Africa	383	422 [r]	394	452 [r]	548 [p, 3]
Spain[4]	11,909	11,218	11,500 [e]	11,500 [e]	11,500
Sudan[e, 4]	2	5	13 [r, 3]	14 [r]	14
Switzerland[e]	300	250	250	250	250
Syria	290	351	375 [e]	375 [e]	375
Taiwan	1	--	--	--	--
Tajikistan[e]	35	35	35	35	35
Tanzania[4]	72	73 [r]	33 [r]	59 [r]	23 [p]
Thailand	6,191	6,326	7,291	7,169 [r]	6,920
Tunisia[e]	125	125	110	130 [r]	130
Turkey	329	264	197	250 [r]	250
Turkmenistan[e]	100	100	11	100	100
Uganda	--	"(7)	"(7)	"(7)	"(7)
United Arab Emirates[e]	90	90	100	100	100
United Kingdom[e, 4]	1,500	1,500	1,500	1,500	1,500
United States[8]	16,300	15,700	16,700	17,200	21,100 [3]
Uruguay[e]	1,127 [3]	1,130	1,130	1,130	1,130
Venezuela	5	-- [r]	-- [r]	-- [r]	10
Yemen	44	41	42	44 [e]	44
Zambia	-- [r]	-- [r]	-- [r]	-- [r]	--
Total	10,500	107,000 [r]	110,000 [r]	112,000 [r]	118,000

See footnotes at end of table.

TABLE 8—Continued
GYPSUM: WORLD PRODUCTION, BY COUNTRY[1, 2]

[e]Estimated. [P]Preliminary. [r]Revised. NA Not available. --Zero.
[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.
[2]Table includes data available through July 15, 2006.
[3]Reported figure.
[4]Includes anhydrite.
[5]Data are for years beginning March 21 of that stated.
[6]Iraq may also produce gypsum, but definitive information on output levels, if any, is not available.
[7]Less than ½ unit.
[8]Excludes byproduct gypsum.

FIGURE 1
GYPSUM MINES, PLANTS, AND OCCURRENCES IN THE CONTERMINOUS UNITED STATES IN 2005



Sources: USGS survey, 2005; Withington, C.F., 1962, Gypsum and anhydrite in the United States (exclusive of Alaska and Hawaii): U.S. Geological Survey Minerals Investigation Resource Map MR-33, scale 1:3,168,000.

FIGURE 2
WALLBOARD MANUFACTURING PLANTS IN THE UNITED STATES