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2019 Minerals Yearbook

LIME [ADVANCE RELEASE]

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

March 2024

Lime

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In 2019, lime production in the United States (including Puerto Rico) was 16.9 million metric tons (Mt) and had a value of $2.32 billion (table 1). The production quantity decreased by 6% and the value decreased by 4% compared with that in 2018. Lime consumption decreased in most major market sectors: chemical, flue gas treatment, industrial, metallurgy, refractory, and sludge treatment. Increases were recorded for sales in construction and water treatment (table 3). On average, prices for lime sold or used were higher in 2019 than in 2018 (table 5).

Lime plants and facilities require close proximity to markets and access to suitable transportation networks to allow for cost-effective production and distribution. The U.S. lime industry is dominated by a few large-scale producers with nationwide supply and distribution networks. Because there is a scarcity of high-quality limestone deposits for which required zoning and mining permits can be obtained, production capacity increases usually are met by replacing older kilns at existing plants thereby using existing air quality permits for new, more efficient, and higher capacity kilns that have reduced emissions.

Lime, as quicklime, is a basic chemical produced in 28 States and Puerto Rico. The U.S. lime industry consisted of 28 companies in 2019. Of these, 15 companies produced lime products for sale, 10 produced lime that was used entirely for internal company purposes, and 3 did both. Owing to its chemical reactivity and short shelf life, lime is not stockpiled in large amounts. Consequently, data on stocks are not collected. Thus, on an annual basis, lime "sold or used" is considered to be equivalent to both production and consumption. In 2019, Alabama and Missouri were the only two States that had production in excess of 2 Mt; three States (Kentucky, Ohio, and Texas) produced between 1 and 2 Mt.

The term "lime," as used throughout this report, refers primarily to six chemicals produced by the calcination of high-purity limestone (calcium carbonate, $CaCO_3$) or dolomite [$CaMg(CO_3)_2$], followed by hydration when necessary. The two high-calcium forms of lime are high-calcium quicklime (calcium oxide, CaO) and high-calcium hydrated lime [calcium hydroxide, $Ca(OH)_2$]. The four calcium-magnesium (dolomitic) forms are dolomitic quicklime ($CaO \cdot MgO$), dolomitic hydrate type N [$Ca(OH)_2 \cdot MgO$], dolomitic hydrate type S [$Ca(OH)_2 \cdot Mg(OH)_2$], and refractory dead-burned dolomite ($CaO \cdot MgO$). The terms "type N" and "type S" refer to "Normal hydrated lime" and "Special hydrated lime" that are differentiated primarily by the compounds' plasticity (ability to retain water) and oxide content. Air-entrained versions of these hydrates are designated as "type NA" and "type SA."

In 2019, all commercially produced lime in the United States was manufactured from limestone or dolomite. Lime also can be produced from a variety of similar carbonate materials, such as aragonite, chalk, coral, marble, and seashells, if they are of high chemical purity. Lime also is regenerated and produced as a byproduct by carbide plants, paper mills, sugar mills, and water-treatment plants. Regenerated lime, however, is not covered in this report.

In the United States, most lime (about 83%) is produced as quicklime (table 1). Hydrated lime (also called slaked lime) is a dry calcium hydroxide powder made from reacting quicklime with a controlled amount of water in a hydrator. Hydrated lime also includes dispersions (suspensions) of calcium hydroxide particles in water, either in the form of milk of lime or lime putty. Milks of lime contain up to 40% by weight of solids, and lime putties contain 55% to 70% of solids. Hydrated lime is used widely in aqueous systems as a low-cost alkali to neutralize or balance acidity (Oates, 1998, p. 1, 229).

Production

Domestic production data for lime were derived by the U.S. Geological Survey (USGS) from a voluntary canvass of U.S. operations. The canvass included primary producers of quicklime and hydrate. To avoid double counting, the canvass did not include independent hydrators that purchase quicklime for hydration. Quantity data were collected for 28 specific and general end uses, and value data were collected by type of lime. Of the 92 operations that were canvassed in 2019, 80 operations responded, 2 of which were idle during the entire year. Data received represented 88% of the total lime sold or used by producers listed in tables 1 through 5. Production data for the nonrespondents were estimated based on prior-year production data and other information.

In 2019, quicklime was produced at 74 lime plants, including 30 plants with colocated hydrating plants. Hydrated lime also was produced at 14 stand-alone hydrating facilities. These numbers do not necessarily agree with the number of plants reported in table 1 because, for data collection purposes, some company operations were combined at the respondent's request. In some States that had no quicklime production, hydrating plants used quicklime sourced from other States. There were also stationary lime slurry plants in some States where hydrated lime was converted (slaked) to form lime slurry (milk of lime) by the addition of water prior to sale. Mobile hot lime slurry production systems also were used to slake quicklime or to make a hydrated lime slurry to the percentage of solids (milks of lime or lime putties) required for specific jobs.

Data on lime sold or used in the United States were reported by U.S. Census Bureau regions (table 2). In 2019, production (or the total amount of lime sold or used by domestic producers) including Puerto Rico, was 16.9 Mt, a 6% decrease compared with that in 2018 (table 2). The Midwest and East South Central regions, combined, accounted for 59% of total production, compared with 63% in 2018 (table 2). The totals included the commercial sale or captive consumption by producers

(described by the term "used") of quicklime, hydrated lime, and dead-burned refractory dolomite. Data on the production of hydrated lime were incomplete because some producers did not report data on downstream hydrating plants.

Most U.S. lime production sold or used was in the form of high-calcium quicklime. In 2019, production of high-calcium quicklime decreased by 8% to 11.3 Mt and dolomitic quicklime production decreased by 4% to 2.7 Mt from that in 2018 (table 1). The production of high-calcium hydrate was essentially unchanged from that in 2018, and dolomitic hydrate production increased slightly from that in 2018. Commercial sales of quicklime and hydrate decreased by 7% to 15.7 Mt and lime produced for captive consumption decreased by 3% to 1.18 Mt, compared with that in 2018.

At yearend, the top 10 U.S. lime-producing companies, in descending order of production, were Lhoist North America; Graymont Ltd.; Carmeuse Americas; Mississippi Lime Co.; Martin Marietta Magnesia Specialties, LLC; United States Lime & Minerals, Inc.; Pete Lien & Sons, Inc.; Cheney Lime & Cement Co.; Greer Lime Co; and Linwood Mining and Minerals Corp. These companies reported production from 45 lime plants and 10 stand-alone hydrating plants and accounted for 99% of the combined commercial lime sales and 91% of total lime production.

On August 1, Mississippi Lime completed its acquisition of the Calera, AL, lime facility, which was previously operated by Southern Lime Corp. The Calera facility increased Mississippi Lime's production facilities to nine locations, supported by a network of distribution sites throughout the United States (Mississippi Lime Co., 2019).

On October 10, Graymont announced plans to build a production facility adjacent to its limestone deposit in Rexton, MI. The facility would produce a variety of lime and limestone products. The production facility was expected to be operational by the end of 2020, contingent on receiving required regulatory approvals (Graymont Ltd., 2019).

Consumption

In 2019, reported U.S. lime consumption decreased in most major market sectors (table 3). The percentage distribution of lime consumption by general end-use sector changed little from that in 2018 and was 36% for metallurgical uses, 26% for environmental uses, 21% for chemical and industrial uses, 12% for construction uses, 4% for miscellaneous uses, and 1% for refractories. These end-use data were based on lime sold or used by domestic producers and did not include lime imports.

Commercial sales (lime sold by producers) accounted for 93% of total U.S. lime consumption (table 1). Captive lime (lime that was used by companies for internal purposes) accounted for the remainder of consumption and was used in the production of steel in basic oxygen furnaces (BOFs), magnesia production, precipitated calcium carbonate production, refractories (dead-burned dolomite), sugar refining, and wastewater. As a result, table 3 lists only the total quantity (commercial plus captive) by end use. Additional end uses with captive consumption are listed in footnote 5 of table 3.

In steel production, quicklime was used as a flux and slagging agent in BOFs and electric arc furnaces (EAFs) to remove impurities, such as phosphorus, silica, and sulfur, from the hot metal. The steel industry accounted for 29% of lime sold or used by domestic lime producers. According to the World Steel Association (2020, p. 1), U.S. steel production in 2019 increased slightly from that in 2018; lime sold for total steel and iron uses in 2019 was 5% less than that in 2018 (table 3).

In nonferrous metallurgy, lime was used in the beneficiation of copper and zinc ores to neutralize the acidic effects of pyrite and other sulfides and to maintain the proper pH in the flotation circuits. It also was used to prevent pyrite from entering the copper or zinc concentrate. Lime was used to process alumina and magnesia, extract uranium from gold slimes, and recover nickel by precipitation.

Gold and silver were recovered using heap leaching and by conventional milling and subsequent leaching of the slurry. Heap leaching involved crushing ore, mixing with lime or portland cement for pH control and sometimes agglomeration, then stacking the ore in heaps on specially prepared pads for treatment with cyanide or thiourea solution. Lime was used to maintain the cyanide or thiourea solution at a pH level between 10 and 11 to maximize the recovery of precious metals and to prevent the creation of hydrogen cyanide gas.

Lime consumption data for nonferrous metallurgical uses [alumina and bauxite processing, flotation processing of sulfide ores (principally copper and gold ores), and unspecified nonferrous uses] are combined to avoid disclosing company proprietary data and are reported in table 3 under "Metallurgical: Nonferrous metallurgy." In 2019, lime consumption in nonferrous metallurgy increased by 5% to 1.18 Mt (table 3) but was lower than the peak of 1.33 Mt in 2015.

Lime was used in numerous processes to treat discharges to the environment in active and abandoned mines. These processes included the treatment of acid-mine drainage from operating and abandoned mines, specialized treatment processes such as catalyzed cementation of arsenic and other heavy metals, and treatment of precious metals mine tailings to recover cyanides.

Lime was used, generally in conjunction with soda ash (Na_2CO_3), for softening municipal and plant process water. This precipitation process removes soluble calcium and magnesium cations, and to a lesser extent, ferrous iron, manganese, strontium, and zinc cations that contribute to the hardness of water. This process also reduces carbonate alkalinity and total dissolved solids. Lime consumption for drinking water treatment increased by 3% in 2019 compared with that in 2018 (table 3).

In sewage treatment, the traditional role of lime was to control pH in the sludge digester, where it removed dissolved and suspended solids containing phosphates and nitrogen compounds. Lime aided in clarifying wastewater and destroying harmful bacteria and was used to stabilize the resulting sewage sludge for beneficial use or disposal. Sewage sludge stabilization, also called biosolids stabilization, reduces odors, pathogens, and putrescibility of the solids. Lime stabilization involves mixing quicklime with the sludge to raise the temperature and pH of the sludge to minimum levels for a specified period of time, depending on the biosolids classification. The National Lime Association (undated) has a concise description of lime's use in biosolids stabilization. In

2019, lime consumption for all sludge treatment decreased by 4% compared with that in 2018 (table 3).

In flue gas treatment (FGT) systems serving coal-fired powerplants, incinerators (most were waste-to-energy powerplants), and other industrial plants, lime was injected into the flue gas to remove gaseous pollutants, particularly sulfur dioxide (SO_2) and hydrochloric acid (HCl). Many FGT systems at utility powerplants were designed to produce byproduct synthetic gypsum ($CaSO_4 \cdot 2H_2O$) from the captured SO_2. In 2019, 20.8 Mt of synthetic gypsum was produced from FGT by utility powerplants (American Coal Ash Association, 2020), although only 12.1 Mt was used. This gypsum is suitable for use in manufacturing wallboard, as an additive in portland cement, and as a soil amendment in agriculture. Hydrated lime was used in another FGT-related market—to control sulfur trioxide (SO_3) emissions from selective catalytic reduction systems installed at powerplants to control emissions of nitrogen oxides (NO_x). Utility powerplants were by far the leading consumers of lime for FGT and accounted for 85% of the total FGT lime market in 2019 (table 3). Incinerators, industrial boilers, and other FGT uses accounted for the remainder. In 2019, lime consumption decreased by 29% in the utility powerplant market and decreased by 3% in the incinerators market and the industrial boilers and other FGT markets, combined (table 3). The use of hydrated lime in FGT in 2019 decreased by 8% to 494,000 t (table 4).

Hydrated lime was used by the pulp and paper industry in the basic kraft pulping process for converting wood chips into wood pulp. Hydrated lime sometimes was used to produce calcium hypochlorite bleach for bleaching the paper pulp. The paper industry also used lime as a coagulant aid in the clarification of plant process water. In 2019, consumption of lime for pulp and paper production increased slightly from that in 2018 (table 3).

Lime was used to make precipitated calcium carbonate (PCC) for use as a specialty filler in premium-quality coated and uncoated papers, paints, and plastics. The most common method of making PCC in the United States was the carbonation process. Carbon dioxide (CO_2) is bubbled through calcium hydroxide (as milk of lime) to form a precipitate of calcium carbonate and water. The reaction conditions determine the size and shape of the resulting PCC crystals. Lime used for PCC production decreased by 11% compared with that in 2018 (table 3).

The chemical industry also used lime in the manufacture of alkalis. Other chemical uses included the production of calcium carbide, which is formed when quicklime is combined with coke; calcium carbide, in turn, was used to make acetylene and calcium cyanamide. Lime also was used to make calcium hypochlorite bleaches, citric acid, petrochemicals, and many other chemicals.

In sugar refining, milk of lime was used to raise the pH of the product stream, precipitating out colloidal impurities. The lime itself was then removed by reaction with CO_2 to precipitate calcium carbonate.

Hydrated lime was used in oil and gas drilling as a source of alkalinity and calcium in oil- and water-base drilling fluids. Drilling fluid applications included increasing the pH, providing excess lime as an alkalinity buffer, flocculating bentonite drilling muds, removing soluble carbonate (CO_3^{2-}) ions, controlling corrosion, and activating fatty-acid oil-base mud additives (M-I SWACO, 2011).

In the construction sector, hydrated lime was used in hot mix asphalt as an antistripping agent. Stripping is generally defined as a loss of adhesion between the aggregate surface and the asphalt binder in the presence of water. Lime also was used in cold, in-place recycling for the rehabilitation of distressed asphaltic pavements. Existing asphaltic pavement is pulverized using a milling machine and a hot lime slurry is added along with asphalt emulsion. The cold recycled mix is placed and compacted by conventional paving equipment, which produces a smooth base course for the new asphaltic surface. In 2019, sales of lime for use in asphalt decreased by 24% compared with those in 2018 (table 3).

Hydrated lime and quicklime also were used to stabilize fine-grained soils, such as hydraulic clay fills or otherwise poor-quality clay and silty materials obtained from cuts or borrow pits, in place of materials that were employed as subbases. Lime also was used in base stabilization, which included upgrading the strength and consistency properties of aggregates that may be judged unusable or marginal without stabilization. Common applications for lime stabilization included the construction of airfields, building foundations, earthen dams, parking areas, and roads.

Lime sales for soil stabilization have tended to be cyclical, especially in major market areas such as Texas. In the soil stabilization market, lime competed with portland cement, cement kiln dust, fly ash, and other additives (liquid enzymes, for example). The choice of material for soil stabilization depended on availability, price, contract specifications, soil chemistry, and State and Federal funding in the case of highway construction projects. The amount of lime consumed for soil stabilization in 2019 increased by 14% compared with that in 2018 (table 3). According to the U.S. Census Bureau (2020, table 2), public spending on highway and street construction was $98.8 billion in 2019, an increase of 9% from the $90.8 billion spent in 2018.

Hydrated lime was used in the building sector for some mortars, plasters, and stuccos. Standard masonry cement mortars that include lime exhibit superior workability balanced with appropriate compressive strength, as well as low water permeability and superior bond strength. Lime was a major constituent in some exterior and interior plasters and stuccos, enhancing the durability, strength, and workability of these finishes. A small amount of hydrated lime also was used in the renovation of old structures built with lime mortars, which were commonplace before the development of portland cement mortars. Modern portland cement-base mortars are incompatible with old lime mortars. Hydrated lime also was used to make synthetic hydraulic lime, which is produced by blending powdered hydrated lime with pulverized pozzolanic or hydraulic materials.

Almost all lime sold or used in 2019 for building use was in the form of hydrate [248,000 t (table 4) out of 251,000 t of total lime (table 3)]. In 2019, the total quantity of lime consumed in building uses, such as in aerated concrete, mortar, plaster, and whitewash, decreased slightly compared with that in 2018 (table 3).

Dead-burned dolomite, also called refractory lime, was used as a component in tar-bonded refractory brick or monolithics manufactured for use in BOFs. Refractory brick also was used in the lining of many treatment and casting ladles, in cement clinker kilns, in argon-oxygen decarburization and vacuum-oxygen decarburization converters, in EAFs, and in continuous steel casting. The data on dead-burned dolomite reported in table 3 were rounded to one significant digit to avoid disclosing company proprietary data; unrounded data show that the consumption of dead-burned dolomite in 2019 was 3% less than that in 2018. Magnesita Refractories Co. at its York, PA, plant and Carmeuse at its Millersville, OH, plant were the only significant domestic producers of dead-burned dolomite. Although dead-burned dolomite was the primary form of lime used in refractories, hydrated lime may be used to produce silica refractory brick used to line industrial furnaces.

Prices

The USGS calculates unit values of lime products from the quantity and value data reported for lime sold or used by the lime producers on a free-on-board plant basis, including the cost of containers. These provide average values that eliminate variables such as potentially significant differences between list prices and individual supply contracts. Lime prices were not published in trade publications, so the data listed in table 5 have historically been used as representative of U.S. lime prices. To avoid disclosing company proprietary data, value data for dead-burned dolomite were not reported separately but were included within the weighted average of all types of lime. The total weighted average price per metric ton of all quicklime and hydrate sold or used in 2019 increased slightly. Annual average prices in 2019 for high-calcium quicklime sold and high-calcium hydrate sold increased by 4% and increased slightly, by $4.50 and $2.50 per metric ton, respectively, compared with those in 2018. Annual average prices for dolomitic quicklime sold decreased by $2.80 per metric ton and that of dolomitic hydrate sold increased by $5.00 per metric ton. During the prior 10 years, the total annual weighted average price for all types of lime increased by $33.80 per metric ton.

Foreign Trade

The United States exported and imported calcined dolomite (dolomitic lime), hydrated lime (slaked lime), hydraulic lime, and quicklime. Total exports and imports of lime were very small—each about 2%—compared with the total quantity produced domestically in 2019. Total exports of lime in 2019 were 347,000 metric tons (t) valued at $63.5 million (table 6). About 97% of exports went to Canada and 3% to other countries. Total imports of lime were 342,000 t valued at $62.4 million; about 89% were from Canada, 8% from Mexico, and 3% from other countries (table 7). Canada provided nearly all the high-calcium quicklime and dolomitic (calcined dolomite) lime and 57% of slaked lime imports.

No tariffs were placed on imports of hydraulic lime, quicklime, and slaked lime from countries with normal trade relations (NTR) with the United States. A 3% ad valorem tariff was placed on imports of calcined dolomite from NTR countries.

World Review

In 2019, global lime production was 430 Mt, slightly higher than that in 2018 but an average of 8% higher than global production in 2015–17 (table 8). The leading lime-producing countries in 2019 were China (72%), India and the United States (4% each), Russia (3%), and Brazil, Germany, and Japan (2% each). Lime was mostly traded on a regional basis because it was a low-value, bulk, and reactive product that could not be shipped long distances and compete with lime produced locally. Most countries have limestone or dolomite deposits, which allowed for at least some local production and consumption. There may also have been some trade between countries on a regional basis where distances are not great, such as within the European Union, or to supply lime products of a quality not locally available.

Except for some industrialized nations, accurate lime production data for individual countries are difficult to obtain and are commonly incomplete. In addition to production by large commercial lime companies, lime was produced by small-scale manufacturers operating simple kilns to supply local consumers and by industries producing lime for internal consumption. Also, crushed limestone production data often are reported as lime data. In some cases, lime sales data have been used as a proxy for country production figures.

Outlook

Lime sales in markets such as chemical and industrial, construction, and steel are expected to follow trends in the gross domestic product of the overall economy. The outlook for FGT (lime's second-leading market) is easier to predict. With the recent boom in natural gas exploration, large increases in natural gas reserves, and low natural gas prices, U.S. electric utilities have increasingly shifted their fuel use from coal to natural gas. Natural gas has the advantage of producing lower levels of emissions than coal and, as a result, natural-gas-fired powerplants usually do not require SO_2 scrubbing, leading to decreased FGT lime consumption. This trend is likely to continue. The U.S. Energy Information Administration (2020, p. 4) reported that total domestic utility-scale electricity generation in 2019 was 37% from natural gas, 24% from coal, and 39% from other sources (hydropower, nuclear, and renewables). For 2020, the forecast is for 39% of the electricity to come from natural gas and 20% from coal. In 2021, natural gas and coal were forecast to generate 34% and 24% of electricity, respectively. Coal use to generate electricity in 2021 was expected to increase as a result of higher natural gas prices.

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TABLE 1
SALIENT LIME STATISTICS[1]

		2015	2016	2017	2018	2019
United States:[2]						
Number of plants[3]		86	86 r	85 r	86 r	84
Lime sold or used by producers:						
Quantity:						
Quicklime:						
High-calcium	thousand metric tons	13,100	12,100 r	12,200	12,400	11,300
Dolomitic	do.	2,550	2,420	2,650	2,810 r	2,700
Total	do.	15,600	14,500	14,800	15,200	14,000
Hydrated lime:						
High-calcium	do.	2,150	2,350	2,360	2,430	2,430
Dolomitic	do.	279	280	276	265	267
Total	do.	2,430	2,630	2,640	2,690	2,700
Dead-burned dolomite[4]	do.	200	200	200	200	200
Total	do.	18,300	17,300	17,600	18,000 r	16,900
Value[5]	thousand dollars	2,290,000	2,160,000	2,300,000	2,410,000 r	2,320,000
Average value	dollars per metric ton	124.40 r	124.20 r	129.70 r	133.60 r	137.60
Lime sold by producers (commercial sales):						
Quantity:						
Quicklime[6]	thousand metric tons	14,500	13,400	13,800	14,100 r	13,100
Hydrated lime	do.	2,430	2,630	2,630	2,690	2,620
Total	do.	17,000	16,100	16,400	16,800 r	15,700
Value[5]	thousand dollars	2,110,000	1,990,000 r	2,130,000	2,240,000 r	2,160,000
Lime used by producers (captive consumption):						
Quantity	thousand metric tons	1,280	1,230	1,200	1,220	1,180
Value[5]	thousand dollars	176,000	168,000	168,000	175,000	160,000
Exports:[7]						
Quantity	thousand metric tons	346	329	391	424 r	347
Value[8]	thousand dollars	62,600	64,500	74,200	83,600	63,500
Imports for consumption:[7]						
Quantity	thousand metric tons	391	376	367	370	342
Value[9]	thousand dollars	66,900	61,500	62,300	66,500 r	62,400
Consumption, apparent[10]	thousand metric tons	18,300	17,300	17,600	18,000	16,900
World production	do.	370,000	410,000	410,000	420,000	430,000

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[1]Table includes data available through December 15, 2020. Data are rounded to no more than three significant digits; may not add to totals shown. Excludes regenerated lime.

[2]Includes Puerto Rico.

[3]Includes most producer-owned hydrating plants not located at lime plants.

[4]Data are rounded to no more than one significant digit to avoid disclosing company proprietary data.

[5]Selling value, free on board plant.

[6]Includes dead-burned dolomite.

[7]Source: U.S. Census Bureau.

[8]Free alongside ship value.

[9]Cost, insurance, and freight value.

[10]Defined as sold or used plus imports minus exports.

TABLE 2

LIME SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY U.S. CENSUS BUREAU REGIONS[1]

Region or division and year	Quantity				Value	
	Hydrated (thousand metric tons)	Quicklime[2] (thousand metric tons)	Total (thousand metric tons)	Percent of total	Total (thousand dollars)	Percent of total
2018:						
Northeast[3]	142	812	954	5	192,000	8
Midwest[4]	947	6,180 r	7,130 r	40	939,000 r	39
South:						
South Atlantic[5]	201	763	964	5	120,000	5
East South Central[6]	316	3,960	4,280	24	534,000	22
West South Central[7]	797	1,150	1,950	11	233,000	10
West[8]	288	2,490	2,780	15	392,000	16
Total	2,690	15,400	18,000 r	100	2,410,000 r	100
2019:						
Northeast[3]	141	891	1,030	6	200,000	9
Midwest[4]	935	5,470	6,400	38	862,000	37
South:						
South Atlantic[5]	173	830	1,000	6	127,000	5
East South Central[6]	292	3,270	3,570	21	479,000	21
West South Central[7]	849	1,240	2,090	12	253,000	11
West[8]	307	2,510	2,820	17	402,000	17
Total	2,700	14,200	16,900	100	2,320,000	100

rRevised.

[1]Table includes data available through December 15, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes dead-burned dolomite.

[3]Production in Massachusetts and Pennsylvania.

[4]Production in Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

[5]Production in Florida, Georgia, Puerto Rico, Virginia, and West Virginia.

[6]Production in Alabama, Kentucky, and Tennessee.

[7]Production in Arkansas, Louisiana, Oklahoma, and Texas.

[8]Production in Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

TABLE 3
LIME SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY USE[1, 2]

(Thousand metric tons)

Use	2018	2019
Chemical and industrial:		
Fertilizer, including aglime	86	60
Glass	W	W
Paper and pulp[3]	877	890
Precipitated calcium carbonate[3]	680	607
Sugar refining[3]	631	585
Other chemical and industrial[4]	1,550	1,430
Total	3,830	3,570
Metallurgical:		
Steel and iron:		
Basic oxygen furnaces[3]	2,300	2,190
Electric arc furnaces	2,650	2,580
Other steel and iron	237	183
Total	5,180 r	4,950
Nonferrous metallurgy[5]	1,120	1,180
Total metallurgical	6,300 r	6,130
Construction:		
Asphalt	247	188
Building uses	254	251
Soil stabilization	1,290	1,470
Other construction	57	57
Total	1,850	1,960
Environmental:		
Flue gas treatment:		
Utility powerplants	3,400	2,420
Incinerators	155	150
Industrial boilers and other flue gas treatment	277	270
Total	3,830	2,840
Sludge treatment:		
Sewage	133	128
Other, industrial and hazardous	W	W
Total	133	128
Water treatment:		
Acid-mine drainage	W	W
Drinking water	788 r	815
Wastewater	349	424
Total	1,090	1,240
Other environmental	213 r	189
Total environmental	5,260 r	4,400
Refractories (dead-burned dolomite)[3, 6]	200	200
Miscellaneous and unspecified	613	653
Grand total	18,000 r	16,900

rRevised. W Withheld to avoid disclosing company proprietary data; included with "Miscellaneous and unspecified."

[1]Table includes data available through December 15, 2020. Data are rounded to no more than three significant digits; may not add to totals shown. Excludes lime kiln dust and regenerated lime.

[2]Includes Puerto Rico.

[3]Includes lime sold and used, where "used" denotes lime produced for internal company use.

[4]May include alkalis, calcium carbide and cyanamide, calcium hypochlorite, citric acid, food (animal or human), oil and grease, oil well drilling, petrochemicals, tanning, and other uses. Magnesia is included here to avoid disclosing proprietary data.

[5]Includes alumina and bauxite, magnesium, metals concentration (copper and gold), and other nonferrous uses.

[6]Data are rounded to no more than one significant digit to avoid disclosing company proprietary data.

TABLE 4
HYDRATED LIME SOLD OR USED IN THE UNITED STATES, BY END USE[1, 2, 3]

(Thousand metric tons)

Use	2018	2019
Chemical and industrial	542 [r]	615
Construction:		
Asphalt	218	149
Building uses	252 [r]	248
Soil stabilization	W	W
Other construction	541	618
Total	1,010	1,020
Environmental:		
Flue gas treatment:		
Utility powerplants	411	361
Incinerators	25	22
Industrial boilers and other flue gas treatment	103	111
Total	539	494
Sludge treatment:		
Sewage	42	29
Other sludge treatment	90	91
Total	132	120
Water treatment:		
Acid-mine drainage	56	41
Drinking water	111	123
Wastewater	125	138
Total	292	301
Other environmental	88	63
Metallurgy	87	89
Grand total	2,690	2,700

[r]Revised. W Withheld to avoid disclosing company proprietary data; included with "Other construction."

[1]Table includes data available through December 15, 2020. Data are rounded to no more than three significant digits; may not add to totals shown. Excludes regenerated lime.

[2]Includes Puerto Rico.

[3]Includes hydrated lime sold and used, where "used" denotes lime produced for internal company use in the building, chemical and industrial, and metallurgical sectors.

TABLE 5
LIME PRICES IN THE UNITED STATES, BY TYPE[1, 2, 3]

Type	2018		2019	
	Dollars per metric ton	Dollars per short ton	Dollars per metric ton	Dollars per short ton
Sold or used:				
Quicklime[4]	126.40 r	114.60 r	128.60	116.70
Hydrated lime	151.60 r	137.50	154.40	140.10
Weighted average all types	134.20 r	121.80 r	137.40	124.70
Sold:				
Quicklime:				
High-calcium	122.20 r	110.90 r	126.70	114.90
Dolomitic	138.00 r	125.20 r	135.20	122.70
Average quicklime[4]	125.20 r	113.60 r	128.30	116.40
Hydrated lime:				
High-calcium	148.30 r	134.50 r	150.80	136.80
Dolomitic	182.60	165.60	187.60	170.20
Average hydrated lime	151.60 r	137.50	154.60	140.20
Weighted average all types	133.60 r	121.20 r	137.60	124.80

rRevised.
[1]Table includes data available through December 15, 2020.
[2]Average value per ton, free on board plant, including cost of containers.
[3]Unit values in metric tons and short tons were rounded independently.
[4]Includes dead-burned dolomite.

TABLE 6
U.S. EXPORTS OF LIME, BY TYPE[1]

(Metric tons and dollars)

Type and country or locality	2018		2019	
	Quantity	Value[2]	Quantity	Value[2]
Calcined dolomite:				
Argentina	474	138,000	233	46,400
Azerbaijan	1	3,540	260	65,000
Brazil	664	319,000	--	--
Canada	76,200 r	18,000,000	65,700	15,800,000
France	988	232,000	4	4,850
Germany	49	18,100	181	66,800
Kazakhstan	196	49,100	115	28,700
Kuwait	--	--	309	90,400
Mexico	432	113,000	906	341,000
United Arab Emirates	80	71,900	245	220,000
Other [12 countries and (or) localities]	251 r	233,000 r	390	161,000
Total	79,300 r	19,100,000	68,300	16,800,000
Hydraulic lime:				
Canada	4,140	1,200,000	1,470	433,000
Finland	34	36,700	--	--
France	10	13,300	--	--
Germany	109	141,000	2	2,700
Liberia	38	14,900	--	--
Mexico	38	29,500	--	--
Papua New Guinea	--	--	17	120,000
Spain	--	--	(3)	3,280
Trinidad and Tobago	56	72,500	--	--
United Kingdom	6	8,070	59	80,000
Other [2 countries and (or) localities]	(3) r	2,950 r	(3)	3,710
Total	4,430	1,520,000	1,550	643,000
Quicklime:				
Bahamas, The	--	--	162	54,300
Canada	288,000	45,800,000	246,000	37,700,000
China	96	80,500	36	31,100
Costa Rica	402	159,000	264	151,000
Ecuador	3	5,400	57	136,000
Ireland	131	213,000	--	--
Mexico	3,070	614,000	3,070	675,000
Netherlands	59	68,200	94	108,000
Saudi Arabia	--	--	63	38,900
Singapore	3,060	1,200,000	876	417,000
Other [9 countries and (or) localities]	55 r	54,700 r	71	72,200
Total	295,000	48,200,000	251,000	39,400,000
Slaked lime, hydrate:				
Bahamas, The	144	53,600	54	20,000
Brazil	40	36,000	292	229,000
Canada	18,900	5,310,000	24,200	5,380,000
Chile	24,300	8,000,000	--	--
Ecuador	200	101,000	38	21,200
Germany	516	184,000	--	--
Guyana	64	13,700	195	35,700
Ireland	--	--	395	346,000
Mexico	1,020	592,000	328	216,000
Panama	229	59,600	223	64,000
Other [14 countries and (or) localities]	358 r	374,000 r	431	389,000
Total	45,800	14,700,000	26,100	6,700,000
Grand total	424,000 r	83,600,000	347,000	63,500,000

See footnotes at end of table.

TABLE 6—Continued
U.S. EXPORTS OF LIME, BY TYPE[1]

[r]Revised. -- Zero.
[1]Table includes data available through July 29, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Free alongside ship value.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF LIME, BY TYPE[1]

(Metric tons and dollars)

Type and country or locality	2018		2019	
	Quantity	Value[2]	Quantity	Value[2]
Calcined dolomite:				
Canada	52,400	8,910,000	44,200	7,510,000
Germany	31	29,600	--	--
Italy	8	16,000	34	18,700
Total	52,400	8,960,000	44,200	7,530,000
Hydraulic lime:				
Belgium	1	16,000	4	40,200
Dominican Republic	23	5,250	--	--
France	980	655,000	817	537,000
Germany	141	38,800	129	31,000
Italy	--	--	16	6,550
Spain	--	--	7	3,130
Total	1,150	715,000	973	618,000
Quicklime:				
Austria	94	112,000	77	98,600
Belgium	--	--	1	2,790
Canada	255,000	39,500,000	231,000	36,200,000
China	146	121,000	270	233,000
Italy	22	46,900	(3)	49,600
Japan	1	39,800	(3)	2,250
Mexico	8,700	1,800,000	10,800	2,150,000
Spain	24	8,510	219	62,900
Thailand	24	67,000	25	71,700
United Kingdom	1,390	1,160,000	1,330	934,000
Total	265,000	42,800,000	243,000	39,800,000
Slaked lime, hydrate:				
Belgium	149	71,000	135	57,500
Canada	29,900	7,320,000	30,300	7,160,000
Dominican Republic	4,080	1,250,000	5,380	1,480,000
France	29	52,900	199	150,000
Germany	249	334,000	149	269,000
Honduras	130	42,200	199	79,700
Mexico	15,900	4,000,000	15,700	4,050,000
Netherlands	422	273,000	576	387,000
Spain	96	33,300	333	165,000
United Kingdom	95	281,000	139	312,000
Other [10 countries and (or) localities]	262	367,000	319	343,000
Total	51,300	14,000,000	53,500	14,500,000
Grand total	370,000	66,500,000 r	342,000	62,400,000

rRevised. -- Zero.

[1]Table includes data available through July 29, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Cost, insurance, and freight value.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8

QUICKLIME AND HYDRATED LIME, INCLUDING DEAD-BURNED DOLOMITE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons, gross weight, unless otherwise specified)

Country or locality[2]	2015	2016	2017	2018	2019
Angola[e]	900	880	840	830	820
Australia, sales[e]	2,000	2,000	2,000	2,000	2,000
Austria[e]	820	830	830	800	820
Belarus	626	474	452	476	464
Belgium[3]	1,468	1,400 [e]	1,324	1,331 [r]	1,561
Bosnia and Herzegovina	423	458	503	579	655
Brazil[e]	8,300	8,100	8,300	8,300	8,100
Bulgaria, industrial	1,474	1,518	1,503	1,545 [r]	1,457
Canada, shipments	1,852	1,807	1,842	1,785 [r]	1,706
Chile[e]	910	920	930	930	920
China[e]	250,000	290,000	290,000	300,000	310,000
Croatia	186	165	121 [r]	100 [r, e]	154
Czechia	1,006	1,066	935	1,038	952
Egypt[e]	720	700	770	800	780
Finland[e]	470	470	470	480 [r]	460
France	2,504	2,500 [e]	2,600 [e]	2,600 [e]	2,600 [e]
Germany	6,847	6,973	6,991	7,112 [r]	7,100 [e]
Hungary	310 [e]	300 [e]	283 [r]	282 [r]	280 [e]
India[e]	16,000	16,000	16,000	16,000	16,000
Iran[e]	2,800	2,900	3,100	3,300	3,500
Ireland[e]	260	250	300	300	300
Israel	554	573	385	614 [r]	706
Italy[e, 3]	3,500	3,500	3,600	3,600	3,500
Japan, quicklime	7,336	7,341	7,431	7,575	7,321
Kazakhstan	871	928	1,048	886 [r]	875
Korea, Republic of[e]	5,100	5,100	5,200	5,200	5,200
Libya[e]	190	270	240	220	330
Malaysia, sales[e]	1,500	1,600	1,600	1,600	1,600
Peru[e]	240	250	250	250	250
Poland	1,942	1,869	1,904	2,684	2,700 [e]
Romania	1,907	1,951	2,126	2,249 [r]	1,958
Russia, industrial and construction	11,221	11,549 [r]	11,179 [r]	11,305 [r]	11,000 [e]
Serbia	316	322	350 [e]	390 [e]	308
Slovakia	778	801	774	791	747
Slovenia	1,103	1,046	1,174 [r]	1,213 [r]	1,186
South Africa, burnt lime sales	1,119	1,131	1,221	1,311 [r]	1,300 [e]
Spain, sales[e]	1,800	1,800	1,800	1,800	1,800
Sweden[e]	640	640 [r]	640 [r]	640 [r]	640
Taiwan	209	214	247	263	294
Thailand, sales[e]	780	780	820	810	730
Tunisia	308	206	189	149	180
Turkey, sales[e]	4,400	4,500	4,700	4,700	4,600
Ukraine	2,717	2,542	2,151	2,298 [r]	2,245
United Arab Emirates[e]	460	470	480	470	470
United Kingdom[e]	1,600	1,400	1,400 [r]	1,500 [r]	1,500
United States, including Puerto Rico	18,300	17,300	17,600	18,000 [r]	16,900
Venezuela[e]	350	290	290	230	190
Vietnam[e]	840	840	840	840	840
Zambia[e]	280	300	310	320	290
Other[e, 4]	1,600	2,100 [r]	1,900 [r]	2,000 [r]	2,000
Total	370,000	410,000	410,000	420,000	430,000

See footnotes at end of table.

TABLE 8—Continued

QUICKLIME AND HYDRATED LIME, INCLUDING DEAD-BURNED DOLOMITE: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

[e]Estimated. [r]Revised.

[1]Table includes data available through December 22, 2020. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than two significant digits; may not add to totals shown.

[2]In addition to the countries and (or) localities listed, Argentina, Chad, Iraq, Lebanon, Mexico, Nigeria, North Korea, Pakistan, Saudi Arabia, Syria, and several other countries may have produced lime, but available information was inadequate to make reliable estimates of output.

[3]Includes hydraulic lime.

[4]Includes Afghanistan, Albania, Algeria (hydraulic), Armenia, Azerbaijan (construction), Cameroon, Cuba, Cyprus (hydrated), Denmark (sales), Eritrea, Estonia, Ethiopia, Guatemala (hydrated), Jamaica, Kenya, Kyrgyzstan, Malawi, Moldova, Mongolia, New Zealand, Nicaragua, North Macedonia, Norway, Panama, Paraguay, Philippines, Qatar, Rwanda, Senegal, Switzerland, Tanzania, Turkmenistan, and Uganda.