USGS
science for a changing world

2015 Minerals Yearbook

EXPLOSIVES [ADVANCE RELEASE]

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

September 2017

Explosives

By Lori E. Apodaca

In 2015, U.S. explosives consumption was 2.04 million metric tons (Mt), a 34% decrease from that of 2014 owing to market conditions; sales of explosives were reported in all States except Delaware. Coal mining, with about 63% of total consumption, continued to be the dominant use for explosives in the United States. Wyoming was the leading explosives-consuming State, accounting for 23% of total U.S. explosives sales. Nevada, Indiana, West Virginia, and Kentucky, in descending order, together accounted for an additional 27% of the total U.S. explosive sales. In 2015, 39.6 million units of detonators were used.

Legislation and Government Programs

On December 21, 2015, the Pipeline and Hazardous Materials Safety Administration (PHMSA) amended its final rule, HM–233D, to establish standards for the safe transportation of explosives on cargo tank motor vehicles and multipurpose bulk trucks transporting materials for blasting operations. PMHSA's final rule authorizes the transport of certain explosives, ammonium nitrates, ammonium nitrate emulsions, and other specific hazardous materials in both nonbulk and bulk packaging, which were not authorized under previous regulations (U.S. Department of Transportation, 2015).

Production

Sales of ammonium-nitrate-based explosives (blasting agents and oxidizers) were 1.99 Mt, a 35% decrease from those of 2014, and accounted for about 98% of U.S. industrial explosives sales. Permissibles and other high explosives accounted for the remaining 2% of U.S. industrial explosive sales. Sales of permissibles (explosives approved for use in gassy and dusty environments) were 90% lower than those in 2014, whereas sales of other high explosives increased by 32% (table 1). A decline in mining industry activity resulted in the decreased consumption of explosives in 2015. A total of 39.6 million units of detonators were sold in 2015, the first year that data on detonators sold for consumption were published (table 2).

Companies contributing data to this report, which are members of the Institute of Makers of Explosives (IME), are as follows:

Accurate Energetic Systems, LLC
Austin Powder Co.
Baker Hughes Inc.
Davey Bickford North America
DynaEnergetics US Inc.
Dyno Nobel Inc.
GEODynamics, Inc.
Hunting Titan, Ltd.
Jet Research Center (a division of Halliburton Co.)
Maine Drilling & Blasting
Maxam North America, Inc.
Nelson Brothers, Inc.
Orica USA Inc.
Owen Oil Tools LP (a division of Core Laboratories N.V.)
Senex Explosives, Inc.
Vet's Explosives, Inc.
W.A. Murphy, Inc.

Dyno Nobel idled its Donora, PA, ammonium nitrate plant on May 1, 2015. The plant was idled because of the decline in production of Appalachian coal resulting from the shift to less expensive shale gas for power generation in the United States (Nitrogen + Syngas, 2015a).

Consumption

The principal application for explosives in the United States was coal mining, accounting for about 63% of the total explosives sales for consumption in 2015 (table 3). U.S. coal production decreased by 10% to 814 Mt in 2015 from that of 2014, according to preliminary data from the U.S. Energy Information Administration (EIA). Coal production in the Appalachian region decreased by 17% compared with production in 2014. In the Midwest, coal production decreased by 11%, and in the Western United States, coal production decreased by 6.5%. Three States (Wyoming, West Virginia, and Kentucky, in descending order of tonnage) led the Nation in coal production, accounting for 59% of the total (U.S. Energy Information Administration, 2016, p. 2–4; table 1). Wyoming was the leading explosives-consuming State.

Construction work accounted for 13% of the total explosives sales, quarrying and nonmetal mining accounted for 12%, metal mining accounted for 9%, and miscellaneous uses were about 3% (table 3). Wyoming, Nevada, Indiana, West Virginia, and Kentucky were, in descending order, the leading explosives-consuming States, each with more than 100,000 t sold and a combined total of 50% of U.S. sales (table 4).

Explosives are used in the mining industry and many segments of the manufacturing and major construction industry; therefore, changes in the consumption of explosives reflect the decrease or increase of activity in these industries. The dollar value of new construction (residential and nonresidential) put in place in 2015 increased by about 11% compared with that in 2014 (U.S. Census Bureau, 2016). Based on monthly data, the seasonally adjusted industry growth rate from 2014 to 2015 for metal mining decreased by 6.5%, and the growth rate for quarrying and nonmetallic mineral mining increased by 4.4% (Federal Reserve Board, 2016).

Classification of Industrial Explosives and Blasting Agents.—Apparent consumption of commercial explosives used for industrial purposes is defined in this report as sales reported to the IME. Commercial explosives imported for industrial uses were also included in sales. The principal distinction between high explosives and blasting agents is their sensitivity to initiation. High explosives are cap sensitive, whereas blasting agents are not. Black powder sales were minor and were last

reported in 1971. The production classifications used in this report are those adopted by the IME.

***High Explosives.*—Permissibles.**—The Mine Safety and Health Administration (MSHA) approved grades by brand name as originally established by the National Institute for Occupational Safety and Health (NIOSH) testing.

Other High Explosives.—These include all high explosives except permissibles.

Blasting Agents and Oxidizers.—These include ammonium nitrate-fuel oil (ANFO) mixtures, regardless of density; slurries, water gels, or emulsions; ANFO blends containing slurries, water gels, or emulsions; and ammonium nitrate in prilled, grained, or liquor (water solution) form. Bulk and packaged forms of these materials are included in this category. In 2015, about 98% of the total blasting agents and oxidizers sales was in bulk form.

Classification of Detonators.—A detonator is any device containing an initiation or primary explosive that is used for initiating detonation in another explosive material as reported to IME. A detonator may not contain more than 10 grams of total explosive by weight, excluding ignition or delay charges. The detonator classifications used in this report are those adopted by the IME.

Electric Detonator.—A detonator designed for, and capable of, initiation by means of an electric current.

Nonelectric Detonator.—A detonator that does not require the use of electric energy to function.

Electronic Detonator.—A detonator that utilizes stored electrical energy as a way of powering an electronic timing delay element/module and that provides initiation energy for firing the base charge.

A total of 39.6 million units of detonators were consumed in 2015, the first year that detonator consumption has been published. Nonelectric detonators accounted for 77% of the total detonators used, followed by electronic at 14%; electric at 8%; and other at 1%.

World Review

Australia.—Incitec Pivot Ltd. reported natural gas supply curtailments at its 330,000-metric-ton-per-year (t/yr) Moranbah ammonium nitrate plant in Queensland. Arrow Energy Pty Ltd., operator of the Moranbah plant, indicated that natural gas supply restrictions would be on the order of 10% to 20% and would likely extend into 2016 (Incitec Pivot Ltd., 2015).

Orica Ltd. was scaling back production at its 530,000-t/yr Yarwun ammonium nitrate plant in Queensland because of an oversupply of ammonium nitrate in the market in Australia. The ammonium nitrate produced at this site was primarily aimed at explosive use in the mining and quarrying industries. Production would be scaled back from 320,000 t/yr to 280,000 t/yr of ammonium nitrate. The plant had not operated at full capacity for some time (Nitrogen + Syngas, 2015b).

Outlook

According to the EIA, total U.S. coal production in 2016 is estimated to have decreased by 18%. Changes in the global coal market have contributed to slower growth in world coal consumption, lower international coal prices, and higher coal output in other coal-exporting countries, which have led to a 3-year decline in U.S. coal exports. Production is projected to increase by about 4% in 2017, with most of the coal production growth occurring in the interior and western regions, as coal use increases in the electric power sector (U.S. Energy Information Administration, 2017, p. 12–13). Based on coal production projections, explosives consumption is expected to decrease in 2016 but increase slightly in 2017 resulting from the expected increased coal consumption in the electric power sector.

References Cited

Federal Reserve Board, 2016, Industrial production and capacity utilization—Tables 1 and 2; 1A, 1B, 1C, 1D, and 1E of the G.17 supplement; and table 10: Federal Reserve Board. (Accessed October 27, 2016, via http://www.federalreserve.gov/releases/G17/table1_2.htm.)

Incitec Pivot Ltd., 2015, Moranbah update: Southbank, Victoria, Australia, Incitec Pivot Ltd. announcement, July 8. (Accessed January 13, 2017, via http://investors.incitecpivot.com.au/phoenix.zhtml?c=170340&p=irol-news.)

Nitrogen + Syngas, 2015a, Dyno Nobel to close AN production at Donora: Nitrogen + Syngas, no. 335, May–June, p. 11.

Nitrogen + Syngas, 2015b, Orica to cut back on AN production: Nitrogen + Syngas, no. 337, September–October, p. 11.

U.S. Census Bureau, 2016, Annual value of construction put in place 2008–2015: U.S. Census Bureau, July 1. (Accessed October 27, 2016, via http://www.census.gov/construction/c30/historical_data.html.)

U.S. Department of Transportation, 2015, Requirements for the safe transportation of bulk explosives: Federal Register, v. 80, no. 244. December 21, p. 79424–79453. (Accessed January 12, 2016, at https://www.federalregister.gov/documents/2015/12/21/2015-31880/hazardous-materials-requirements-for-the-safe-transportation-of-bulk-explosves-rrr.)

U.S. Energy Information Administration, 2016, Annual coal report 2015: U.S. Energy Information Administration, November, 59 p. (Accessed January, 12, 2016, at https://www.eia.gov/coal/annual/pdf/acr.pdf.)

U.S. Energy Information Administration, 2017, Short-term energy outlook: U.S. Energy Information Administration, January, 54 p. (Accessed January 12, 2017, at http://www.eia.gov/outlooks/steo/pdf/steo_full.pdf.)

GENERAL SOURCES OF INFORMATION

Other

Institute of Makers of Explosives

TABLE 1
SALIENT STATISTICS OF INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS SOLD FOR CONSUMPTION IN THE UNITED STATES[1]

(Metric tons)

Class	2011	2012	2013	2014	2015
Permissibles	1,020	1,470	1,440	2,400	249
Other high explosives	21,900	31,400	32,900	35,700	47,200
Blasting agents and oxidizers	2,980,000	3,350,000	3,020,000	3,060,000	1,990,000
Total	3,000,000	3,380,000	3,050,000	3,100,000	2,040,000

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

Source: Institute of Makers of Explosives.

TABLE 2
SALIENT STATISTICS OF DETONATORS SOLD FOR CONSUMPTION IN THE UNITED STATES[1]

(Units)

Class	2011	2012	2013	2014	2015
Electric	NA	NA	NA	NA	3,250,000
Nonelectric	NA	NA	NA	NA	30,300,000
Electronic	NA	NA	NA	NA	5,680,000
Other	NA	NA	NA	NA	367,000
Total	NA	NA	NA	NA	39,600,000

NA Not available.

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

Source: Institute of Makers of Explosives.

TABLE 3
ESTIMATED INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS SOLD FOR CONSUMPTION IN THE UNITED STATES, BY CLASS AND USE[1, 2]

(Thousand metric tons)

Class	Coal mining	Quarrying and nonmetal mining	Metal mining	Construction work	All other purposes	Total
2014:						
Permissibles	2	(3)	(3)	(3)	--	2
Other high explosives	4	12	1	19	1	36
Blasting agents and oxidizers	2,040	331	269	335	79	3,060
Total	2,050	343	270	354	80	3,100
2015:						
Permissibles	(3)	(3)	(3)	(3)	--	(3)
Other high explosives	4	15	1	24	2	47
Blasting agents and oxidizers	1,280	234	175	250	54	1,990
Total	1,280	250	176	274	56	2,040

-- Zero.

[1]Distribution of industrial explosives and blasting agents by consuming industry, estimated from indices of industrial production and economies as reported by the U.S. Department of Energy, the Federal Reserve Board, the U.S. Department of Transportation, and the U.S. Census Bureau.

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

[3]Less than ½ unit.

TABLE 4
INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS SOLD FOR CONSUMPTION IN THE UNITED STATES, BY STATE AND CLASS[1]

(Metric tons)

	2014				2015			
	Fixed high explosives				Fixed high explosives			
State	Permissibles	Other high explosives	Blasting agents and oxidizers	Total	Permissibles	Other high explosives	Blasting agents and oxidizers	Total
Alabama	9	275	9,080	9,360	5	435	34,300	34,700
Alaska	--	621	9,950	10,600	--	525	27,100	27,600
Arizona	--	616	63,700	64,300	--	1,720	35,600	37,300
Arkansas	--	418	18,800	19,200	--	537	9,790	10,300
California	--	333	33,900	34,200	--	315	28,100	28,400
Colorado	--	684	61,700	62,400	--	1,130	20,700	21,900
Connecticut	--	211	2,950	3,160	--	382	3,100	3,480
Delaware	--	--	--	--	--	--	--	--
Florida	--	257	21,700	22,000	--	180	12,900	13,000
Georgia	--	330	24,400	24,800	--	829	26,400	27,200
Hawaii	--	(2)	248	248	--	--	58	58
Idaho	--	208	5,690	5,900	--	129	10,300	10,400
Illinois	4	512	62,100	62,600	(2)	769	36,800	37,600
Indiana	--	1,110	278,000	279,000	--	844	144,000	145,000
Iowa	--	1,030	39,000	40,000	--	1,480	25,200	26,700
Kansas	--	48	6,750	6,790	7	35	3,070	3,120
Kentucky	207	1,920	174,000	176,000	13	5,620	116,000	122,000
Louisiana	--	236	2,490	2,730	--	336	2,710	3,050
Maine	--	126	3,300	3,420	--	92	3,360	3,460
Maryland[3]	--	98	12,700	12,800	(2)	82	9,640	9,720
Massachusetts	--	141	5,680	5,820	--	116	6,090	6,210
Michigan	--	179	41,700	41,800	--	207	27,500	27,700
Minnesota	--	148	120,000	120,000	--	343	78,700	79,000
Mississippi	--	9	3	12	--	6	2	8
Missouri	159	3,050	88,400	91,600	(2)	2,510	40,800	43,300
Montana	--	5,360	35,800	41,100	--	3,460	68,300	71,700
Nebraska	--	37	1,890	1,920	--	46	2,750	2,790
Nevada	152	1,190	226,000	228,000	(2)	1,610	154,000	156,000
New Hampshire	--	331	8,070	8,400	--	454	5,800	6,260
New Jersey	--	37	6,760	6,790	--	33	2,850	2,880
New Mexico	--	142	68,000	68,200	--	2,080	26,000	28,100
New York	1	1,250	27,400	28,600	(2)	1,570	16,100	17,700
North Carolina	--	351	18,700	19,100	--	333	17,700	18,000
North Dakota	--	15	1,590	1,610	--	21	2,370	2,390
Ohio	--	1,060	69,400	70,400	--	1,210	46,100	47,300
Oklahoma	1	655	30,000	30,700	--	217	19,300	19,500
Oregon	--	85	9,760	9,850	--	146	4,830	4,970
Pennsylvania	53	2,000	98,600	101,000	74	2,810	74,200	77,000
Rhode Island	--	32	1,620	1,650	--	26	1,540	1,560
South Carolina	--	40	6,160	6,200	--	52	8,000	8,050
South Dakota	--	5	5,840	5,840	--	3	3,800	3,800
Tennessee	1,180	4,750	20,000	25,900	3	2,140	23,800	26,000
Texas	1	1,090	72,700	73,800	--	2,670	46,100	48,800
Utah	61	575	67,800	68,500	11	440	76,800	77,200
Vermont	6	77	2,630	2,720	8	99	7,680	7,790
Virginia	264	1,190	85,100	86,600	95	811	58,900	59,800
Washington	215	648	13,500	14,400	--	971	13,300	14,200
West Virginia	42	1,210	220,000	222,000	32	705	131,000	132,000
Wisconsin	--	436	19,300	19,700	--	604	16,500	17,100
Wyoming	46	549	854,000	855,000	--	6,060	462,000	468,000
Total	2,400	35,700	3,060,000	3,100,000	249	47,200	1,990,000	2,040,000

-- 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 the District of Columbia.

Source: Institute of Makers of Explosives.