USGS
science for a changing world

2017 Minerals Yearbook

EXPLOSIVES [ADVANCE RELEASE]

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

April 2020

Explosives

By Lori E. Apodaca

In 2017, total U.S. consumption of explosives increased to 1.74 million metric tons (Mt), a 6% increase from that of 2016 and a 15% decrease from that of 2015 owing to changes in market conditions (mainly coal mining) (table 1); sales of explosives were reported in all States except Delaware. Coal mining, with about 58% of total consumption, continued to be the dominant use for explosives in the United States (table 3). Wyoming was the leading explosives-consuming State, accounting for 25% of total U.S. explosives sales. Indiana, Nevada, and West Virginia, in descending order, together accounted for an additional 21% of the total U.S. explosives sales (table 4). In 2017, 48.7 million units of detonators were used, a 49% increase from that of 2016 (table 2).

Legislation and Government Programs

The Consolidated Appropriations Act of 2016 provided $4.5 million to the Department of Homeland Security (DHS), allowing the DHS to continue the rulemaking process to secure ammonium nitrate and other explosives precursors that can be used to make improvised explosive devices (IEDs). As part of these efforts, the DHS contracted with the National Academies of Sciences, Engineering, and Medicine (NASEM) to study the risks presented by each explosives precursor in the United States and to recommend measures to assist in preventing their misuse.

In November 2017, the NASEM published a report that identifies the priority precursor chemicals used in the manufacturing of IEDs and suggested controls that could be considered as part of a voluntary or regulatory program. In addition, the report examines domestic and international regulations and compares economic, security, and other tradeoffs among possible control strategies (National Academies of Sciences, Engineering, and Medicine, 2017, p. 1–8). The Institute of Makers of Explosives (IME) provided input to the NASEM on the U.S. explosives industry's security standards, best practices, and how security is maintained throughout the supply chain (Institute of Makers of Explosives, 2017).

Production

Sales of ammonium-nitrate-based explosives (blasting agents and oxidizers) were 1.71 Mt, a 6% increase from those of 2016 and a 14% decrease from those of 2015, and accounted for 98% of U.S. industrial explosives sales in 2017. Permissibles and other high explosives accounted for the remaining 2% of U.S. industrial explosives sales. Sales of permissibles (explosives approved for use in gassy and dusty environments) were 77% higher than those in 2016, whereas sales of other high explosives decreased by 10% (table 1). An increase in coal mining resulted in increased consumption of explosives in 2017; however, consumption was 44% lower than the high of 2014. Total detonators sold were 48.7 million units in 2017, a 49% increase from that of 2016 (table 2).

Companies contributing data to this report, which are members of the 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.

Consumption

The principal application for explosives in the United States was coal mining, accounting for about 58% of the total explosives sales for consumption in 2017 (table 3). U.S. coal production increased by 6% to 702 Mt in 2017 from that of 2016, according to preliminary data from the U.S. Energy Information Administration (EIA). Coal production in the Appalachian region increased by 10% compared with production in 2016. In the Midwest, coal production increased slightly, and in the Western United States, coal production increased by 6%. Two States (Wyoming and West Virginia, in descending order of tonnage) led the Nation in coal production, accounting for 53% of the total (National Mining Association, 2018).

Construction work accounted for 16% of the total explosives sales, quarrying and nonmetal mining accounted for 14%, metal mining accounted for 9%, and miscellaneous uses were about 3% (table 3). Wyoming, Indiana, Nevada, and West Virginia were, in descending order, the leading explosives-consuming States, each with more than 100,000 metric tons sold and a combined total of 47% 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 2017 increased by about 5% compared with that in 2016 (U.S. Census Bureau, 2018). Based on monthly data, the seasonally adjusted industry growth rate from 2016 to 2017 for metal mining decreased slightly, and the growth rate for quarrying and nonmetallic mineral mining increased

slightly (Federal Reserve Board, 2018). The explosives and blasting agents used are estimated in table 3 by amount sold for consumption in each category from demand in previous years; however, this does not necessarily reflect decrease or increase in the industry activity.

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 2017, about 98% of the total sales of blasting agents and oxidizers were 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 the 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 uses stored electrical energy as a way of powering an electronic timing delay element or module and that provides initiation energy for firing the base charge.

A total of 48.7 million units of detonators were consumed in 2017, a 49% increase from that of 2016. Nonelectric detonators accounted for 79% of the total detonators used, followed by electronic at 11%; electric at 9%; and other at 1% (table 2).

World Review

France.—Yara International ASA announced that it planned to cease operations at its Pardies site. The site was small in scale and lacked raw materials and export competitiveness. Production capacity was approximately 100,000 metric tons per year of technical-grade ammonium nitrate (Nitrogen + Syngas, 2017).

Outlook

According to the EIA, total U.S. coal production in 2018 is estimated to decrease by 1.1%. Decreased consumption of coal was projected as a result of decreased use of coal in the electric power sector and the continued increase in the use of natural gas in the electric power sector (U.S. Energy Information Administration, 2018, p. 2). Based on coal production projections, explosives consumption is expected to decrease slightly in 2018.

References Cited

Federal Reserve Board, 2018, Industrial production and capacity utilization—Tables 1 and 2; 1A, 1B, 1C, 1D, and 1E of the G.17 supplement; and table 10, August 15: Federal Reserve Board. (Accessed August 29, 2018, via http://www.federalreserve.gov/releases/G17/table1_2.htm.)

Institute of Makers of Explosives, 2017, Institute of Makers of Explosives responds to NAS precursors report: Washington, DC, Institute of Makers of Explosives news release, November 29. (Accessed November 2, 2018, at https://www.ime.org/news/details/603.)

National Academies of Sciences, Engineering, and Medicine, 2017, Reducing the threat of improvised explosive device attacks by restricting access to explosive precursor chemicals: Washington, DC, The National Academies Press, November, 198 p. (Accessed November 2, 2018, at https://doi.org/10.17226/24862.)

National Mining Association, 2018, U.S. coal production by State, 2005–2016: Washington, DC, National Mining Association, May, 1 p. (Accessed August 29, 2018, at https://nma.org/wp-content/uploads/2017/11/coal_production_by_state_2017p.pdf.)

Nitrogen + Syngas, 2017, Yara to close Pardies plant: Nitrogen + Syngas, no. 347, May–June, p. 10.

U.S. Census Bureau, 2018, Annual value of construction put in place 2008–2017: U.S. Census Bureau, July 2. (Accessed August 29, 2018, via http://www.census.gov/construction/c30/historical_data.html.)

U.S. Energy Information Administration, 2018, Short-term energy outlook: U.S. Energy Information Administration, August, 48 p. (Accessed September 10, 2018, at https://www.eia.gov/outlooks/steo/archives/Aug18.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	2013	2014	2015	2016	2017
Permissibles	1,440	2,400	249	135	239
Other high explosives	32,900	35,700	47,200	42,600	38,200
Blasting agents and oxidizers	3,020,000	3,060,000	1,990,000	1,600,000	1,710,000
Total	3,050,000	3,100,000	2,040,000	1,650,000	1,740,000

[1]Table includes data available through October 31, 2018. 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	2013	2014	2015	2016	2017
Electric	NA	NA	3,250,000	2,720,000	4,290,000
Nonelectric	NA	NA	30,300,000	24,900,000	38,700,000
Electronic	NA	NA	5,680,000	4,940,000	5,390,000
Other	NA	NA	367,000	198,000	342,000
Total	NA	NA	39,600,000	32,700,000	48,700,000

NA Not available.
[1]Table includes data available through October 31, 2018. 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
2016:						
Permissibles	(3)	(3)	(3)	(3)	--	(3)
Other high explosives	4	12	2	23	2	43
Blasting agents and oxidizers	938	218	159	240	48	1,600
Total	942	230	161	263	50	1,650
2017:						
Permissibles	(3)	(3)	(3)	(3)	--	(3)
Other high explosives	3	13	1	21	1	38
Blasting agents and oxidizers	1,020	222	160	258	50	1,710
Total	1,020	235	161	279	51	1,740

-- Zero.
[1]Table includes data available through October 31, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]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.
[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)

	2016				2017			
	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	(2)	171	4,860	5,030	8	127	23,000	23,100
Alaska	--	731	37,400	38,100	--	941	18,200	19,200
Arizona	8	1,370	22,600	24,000	11	1,340	24,200	25,500
Arkansas	--	61	10,300	10,300	--	60	27,400	27,500
California	--	372	26,800	27,200	--	410	31,800	32,200
Colorado	--	1,390	12,700	14,100	--	1,150	2,890	4,040
Connecticut	--	277	3,330	3,610	--	195	3,680	3,880
Delaware	--	--	--	--	--	--	--	--
Florida	--	133	16,000	16,100	--	95	15,900	16,000
Georgia	--	868	23,500	24,400	--	826	26,800	27,700
Hawaii	--	--	80	80	--	(2)	81	81
Idaho	--	47	6,800	6,850	--	62	4,800	4,860
Illinois	--	761	24,600	25,400	--	816	48,200	49,000
Indiana	--	525	123,000	123,000	--	473	154,000	154,000
Iowa	--	1,430	21,900	23,400	--	1,350	21,100	22,500
Kansas	1	23	1,680	1,700	--	27	1,340	1,370
Kentucky	--	6,490	48,900	55,400	49	2,080	47,400	49,500
Louisiana	--	498	1,950	2,450	--	437	984	1,420
Maine	--	99	3,960	4,060	--	95	3,520	3,610
Maryland[3]	(2)	106	8,620	8,730	(2)	113	6,700	6,820
Massachusetts	--	129	6,050	6,180	--	130	7,200	7,330
Michigan	--	166	24,200	24,300	--	279	25,000	25,300
Minnesota	--	242	58,400	58,700	--	254	80,300	80,500
Mississippi	--	4	(2)	5	--	6	1	7
Missouri	1	2,450	41,800	44,300	(2)	2,120	39,800	41,900
Montana	--	3,180	55,800	58,900	--	3,050	46,500	49,500
Nebraska	--	40	1,840	1,880	--	23	1,920	1,950
Nevada	--	1,280	121,000	122,000	--	1,290	112,000	113,000
New Hampshire	--	506	6,180	6,690	--	325	7,140	7,470
New Jersey	--	49	1,680	1,730	--	26	1,740	1,770
New Mexico	--	1,400	25,900	27,300	--	552	24,000	24,600
New York	(2)	1,290	13,400	14,600	--	1,300	17,100	18,400
North Carolina	--	418	19,000	19,400	--	425	20,800	21,300
North Dakota	--	15	1,850	1,860	--	27	1,960	1,980
Ohio	--	787	48,600	49,400	--	661	39,000	39,700
Oklahoma	--	255	15,700	15,900	--	306	10,000	10,400
Oregon	--	148	4,820	4,970	--	124	4,420	4,550
Pennsylvania	49	3,130	61,300	64,500	35	3,290	72,000	75,400
Rhode Island	--	27	1,340	1,370	--	18	1,200	1,210
South Carolina	--	86	10,500	10,600	--	94	12,300	12,400
South Dakota	--	5	4,690	4,700	--	5	2,950	2,960
Tennessee	--	1,400	18,500	19,900	18	1,680	19,200	20,900
Texas	--	1,980	47,800	49,800	--	3,340	26,400	29,800
Utah	2	670	57,000	57,700	1	975	63,200	64,200
Vermont	5	100	2,700	2,810	3	63	2,530	2,590
Virginia	46	752	37,700	38,500	59	914	33,600	34,500
Washington	--	755	11,600	12,300	--	358	11,300	11,700
West Virginia	21	546	87,100	87,700	55	463	106,000	107,000
Wisconsin	--	743	13,800	14,500	--	1,030	17,000	18,000
Wyoming	--	4,660	404,000	409,000	--	4,440	437,000	441,000
Total	135	42,600	1,600,000	1,650,000	239	38,200	1,710,000	1,740,000

-- Zero.

[1]Table includes data available through October 31, 2018. 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.