



# 2016 Minerals Yearbook

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## EXPLOSIVES [ADVANCE RELEASE]

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# EXPLOSIVES

By Lori E. Apodaca

In 2016, total U.S. consumption of explosives decreased for the second year in a row to 1.65 million metric tons (Mt), a 19% decrease from that of 2015 and a 47% decrease from that of 2014 owing to market conditions; sales of explosives were reported in all States except Delaware. Coal mining, with about 57% of total consumption, continued to be the dominant use for explosives in the United States. Wyoming was the leading explosives-consuming State, accounting for 25% of total U.S. explosives sales. Indiana, Nevada, West Virginia, and Pennsylvania, in descending order, together accounted for an additional 24% of the total U.S. explosive sales. In 2016, 32.7 million units of detonators were used, a 17% decrease from that of 2015.

## Legislation and Government Programs

On December 21, 2016, the U.S. Environmental Protection Agency finalized a rule updating its Risk Management Program (RMP) regulations for companies that handle hazardous chemicals. As a result of discussions with The Institute of Makers of Explosives (IME), ammonium nitrate was not included as one of the chemicals subject to this rule. IME indicated that the Occupational Safety and Health Administration (OSHA) regulations at 29 CFR 1910.109(i) provided regulations for the handling, storage, and use of ammonium nitrate. IME proposed to OSHA a series of amendments to strengthen those regulations (Institute of Makers of Explosives, The, 2016).

## Production

Sales of ammonium-nitrate-based explosives (blasting agents and oxidizers) were 1.60 Mt, a 20% decrease from those of 2015 and a 48% decrease from those of 2014, and accounted for 97% of U.S. industrial explosives sales in 2016. Permissibles and other high explosives accounted for the remaining 3% of U.S. industrial explosive sales. Sales of permissibles (explosives approved for use in gassy and dusty environments) were 46% lower than those in 2015, whereas sales of other high explosives decreased by 10% (table 1). A decline in mining industry activity resulted in the decreased consumption of explosives in 2016. Total detonators sold were 32.7 million units in 2016, a 17% decrease from that of 2015 (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.

In August, Geneva Nitrogen LLC, a joint venture between Austin Powder Co. and Orica USA Inc., announced a halt in production of industrial-grade ammonium nitrate and nitric acid at its Geneva plant in Vineyard, UT. The closing of the plant was a result of the reduced demand for ammonium nitrate caused by reduced activity in the mining industry (Green Markets, 2016).

## Consumption

The principal application for explosives in the United States was coal mining, accounting for about 57% of the total explosives sales for consumption in 2016 (table 3). U.S. coal production decreased by 19% to 661 Mt in 2016 from that of 2015, according to preliminary data from the U.S. Energy Information Administration (EIA). Coal production in the Appalachian region decreased by 19% compared with production in 2015. In the Midwest, coal production decreased by 14%, and in the Western United States, coal production decreased by 20%. Two States (Wyoming and West Virginia, in descending order of tonnage) led the Nation in coal production, accounting for 52% of the total (National Mining Association, 2017).

Construction work accounted for 16% of the total explosives sales, quarrying and nonmetal mining accounted for 14%, metal mining accounted for 10%, 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 80,000 metric tons sold and a combined total of 45% 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 2016 increased by about 6% compared with that in 2015 (U.S. Census Bureau, 2017). Based on monthly data, the seasonally adjusted industry growth rate from 2015 to 2016 for metal mining increased slightly, and the growth rate for quarrying and nonmetallic mineral mining increased by 2.8% (Federal Reserve Board, 2017). 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 2016, 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 32.7 million units of detonators were consumed in 2016, a 17% decrease from that of 2015. Nonelectric detonators accounted for 76% of the total detonators used, followed by electronic at 15%; electric at 8%; and other at 1%.

## World Review

**Australia.**—Yara International ASA and Orica Ltd. began wet commissioning of their explosive (technical)-grade ammonium nitrate plant at Pilbara on the Burrup Peninsula in Western Australia. The 350,000-metric-ton-per-year (t/yr) ammonium nitrate plant was to be fully integrated with Yara's Pilbara Fertilisers Pty Ltd 850,000-t/yr ammonia plant. Ammonium nitrate was to be marketed to mining operations in the Pilbara region (Nitrogen + Syngas, 2016).

## Outlook

According to the EIA, total U.S. coal production in 2017 is estimated to have increased by 8%. Increased consumption of coal was projected as a result of increased U.S. natural gas prices, increased use of coal in the electric power sector, and changes in the global coal market that contributed to an increase in world coal consumption (U.S. Energy Information Administration, 2017, p. 2–3). Based on coal production projections, explosives consumption is expected to increase in 2017.

## References Cited

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- U.S. Energy Information Administration, 2017, Short-term energy outlook: U.S. Energy Information Administration, September, 49 p. (Accessed September 12, 2017, via <https://www.eia.gov/outlooks/steo/>.)

## 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<sup>1</sup>

(Metric tons)

Class	2012	2013	2014	2015	2016
Permissibles	1,470	1,440	2,400	249	135
Other high explosives	31,400	32,900	35,700	47,200	42,600
Blasting agents and oxidizers	3,350,000	3,020,000	3,060,000	1,990,000	1,600,000
Total	3,380,000	3,050,000	3,100,000	2,040,000	1,650,000

<sup>1</sup>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<sup>1</sup>

(Units)

Class	2012	2013	2014	2015	2016
Electric	NA	NA	NA	3,250,000	2,720,000
Nonelectric	NA	NA	NA	30,300,000	24,900,000
Electronic	NA	NA	NA	5,680,000	4,940,000
Other	NA	NA	NA	367,000	198,000
Total	NA	NA	NA	39,600,000	32,700,000

NA Not available.

<sup>1</sup>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<sup>1,2</sup>

(Thousand metric tons)

Class	Coal mining	Quarrying and nonmetal mining	Metal mining	Construction work	All other purposes	Total
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
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

-- Zero.

<sup>1</sup>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.

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>Less than ½ unit.

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

(Metric tons)

State	2015				2016			
	Fixed high explosives			Total	Fixed high explosives			Total
	Permissibles	Other high explosives	Blasting agents and oxidizers		Permissibles	Other high explosives	Blasting agents and oxidizers	
Alabama	5	435	34,300	34,700	(2)	171	4,860	5,030
Alaska	--	525	27,100	27,600	--	731	37,400	38,100
Arizona	--	1,720	35,600	37,300	8	1,370	22,600	24,000
Arkansas	--	537	9,790	10,300	--	61	10,300	10,300
California	--	315	28,100	28,400	--	372	26,800	27,200
Colorado	--	1,130	20,700	21,900	--	1,390	12,700	14,100
Connecticut	--	382	3,100	3,480	--	277	3,330	3,610
Delaware	--	--	--	--	--	--	--	--
Florida	--	180	12,900	13,000	--	133	16,000	16,100
Georgia	--	829	26,400	27,200	--	868	23,500	24,400
Hawaii	--	--	58	58	--	--	80	80
Idaho	--	129	10,300	10,400	--	47	6,800	6,850
Illinois	(2)	769	36,800	37,600	--	761	24,600	25,400
Indiana	--	844	144,000	145,000	--	525	123,000	123,000
Iowa	--	1,480	25,200	26,700	--	1,430	21,900	23,400
Kansas	7	35	3,070	3,120	1	23	1,680	1,700
Kentucky	13	5,620	116,000	122,000	--	6,490	48,900	55,400
Louisiana	--	336	2,710	3,050	--	498	1,950	2,450
Maine	--	92	3,360	3,460	--	99	3,960	4,060
Maryland <sup>3</sup>	(2)	82	9,640	9,720	(2)	106	8,620	8,730
Massachusetts	--	116	6,090	6,210	--	129	6,050	6,180
Michigan	--	207	27,500	27,700	--	166	24,200	24,300
Minnesota	--	343	78,700	79,000	--	242	58,400	58,700
Mississippi	--	6	2	8	--	4	(2)	5
Missouri	(2)	2,510	40,800	43,300	1	2,450	41,800	44,300
Montana	--	3,460	68,300	71,700	--	3,180	55,800	58,900
Nebraska	--	46	2,750	2,790	--	40	1,840	1,880
Nevada	(2)	1,610	154,000	156,000	--	1,280	121,000	122,000
New Hampshire	--	454	5,800	6,260	--	506	6,180	6,690
New Jersey	--	33	2,850	2,880	--	49	1,680	1,730
New Mexico	--	2,080	26,000	28,100	--	1,400	25,900	27,300
New York	(2)	1,570	16,100	17,700	(2)	1,290	13,400	14,600
North Carolina	--	333	17,700	18,000	--	418	19,000	19,400
North Dakota	--	21	2,370	2,390	--	15	1,850	1,860
Ohio	--	1,210	46,100	47,300	--	787	48,600	49,400
Oklahoma	--	217	19,300	19,500	--	255	15,700	15,900
Oregon	--	146	4,830	4,970	--	148	4,820	4,970
Pennsylvania	74	2,810	74,200	77,000	49	3,130	61,300	64,500
Rhode Island	--	26	1,540	1,560	--	27	1,340	1,370
South Carolina	--	52	8,000	8,050	--	86	10,500	10,600
South Dakota	--	3	3,800	3,800	--	5	4,690	4,700
Tennessee	3	2,140	23,800	26,000	--	1,400	18,500	19,900
Texas	--	2,670	46,100	48,800	--	1,980	47,800	49,800
Utah	11	440	76,800	77,200	2	670	57,000	57,700
Vermont	8	99	7,680	7,790	5	100	2,700	2,810
Virginia	95	811	58,900	59,800	46	752	37,700	38,500
Washington	--	971	13,300	14,200	--	755	11,600	12,300
West Virginia	32	705	131,000	132,000	21	546	87,100	87,700
Wisconsin	--	604	16,500	17,100	--	743	13,800	14,500
Wyoming	--	6,060	462,000	468,000	--	4,660	404,000	409,000
Total	249	47,200	1,990,000	2,040,000	135	42,600	1,600,000	1,650,000

-- Zero.

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Less than ½ unit.

<sup>3</sup>Includes the District of Columbia.

Source: Institute of Makers of Explosives.