



2011 Minerals Yearbook

EXPLOSIVES

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In 2011, U.S. explosives consumption was 3.00 million metric tons (Mt), about a 12% increase from that of 2010; sales of explosives were reported in all States except Delaware. Coal mining, with about 71% of total consumption, continued to be the dominant use for explosives in the United States. Wyoming, West Virginia, and Kentucky, in descending order, led the Nation in coal production, accounting for 62% of the total. These States were also the leading explosives-consuming States, accounting for 47% of total U.S. explosives sales.

Legislation and Government Programs

The U.S. Department of Homeland Security (DHS) proposed new regulations to create the Ammonium Nitrate Security Program for the safe handling of ammonium nitrate across the United States. The Ammonium Nitrate Security Act was passed by Congress in 2007; at that time, DHS was authorized to develop a program to regulate ammonium nitrate. Since the act was passed, the U.S. industry has followed voluntary standards; however, under the proposed Ammonium Nitrate Security Program, these standards would become mandatory. Under the proposed regulations, those engaged in the sale and transfer of ammonium nitrate would be barred from selling or transferring 11.3 kilograms (25 pounds) or more of ammonium nitrate to anyone who is not registered with DHS. In addition, those engaged in the sale and transfer of ammonium nitrate would be required to report losses or thefts to federal authorities within 24 hours. All records related to the sale and transfer of ammonium nitrate would need to be maintained for 2 years. Comments from any interested persons on the proposed regulations were due to DHS by December 1 (Fertilizer Week, 2011c; U.S. Department of Homeland Security, 2011, p. 46908).

Production

Sales of ammonium-nitrate-based explosives (blasting agents and oxidizers) were 2.98 Mt, which was 12% higher than those in 2010, and accounted for about 99% of U.S. industrial explosives sales. Sales of permissibles (explosives approved for use in gassy and dusty environments) were about 3% higher than those in 2010, and sales of other high explosives decreased by 3% (table 1).

Companies contributing data to this report, that 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 USA, Inc.
Douglas Explosives, 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.
Viking Explosives and Supply Inc.
W.A. Murphy, Inc.

On February 17, U.S. Nitrogen, LLC (a subsidiary of Austin Powder Co.) broke ground on a \$200 million liquid ammonium nitrate plant in Mosheim, TN. The liquid ammonium nitrate plant would have a production capacity of 380 metric tons per day (t/d) and would include a 180-t/d anhydrous ammonia plant and a 300-t/d nitric acid plant. U.S. Nitrogen planned to ship the liquid ammonium nitrate product to Austin Powder's principal manufacturing site in Ohio and those elsewhere in the United States to upgrade into explosives (Green Markets, 2011b; Jones, 2012).

Consumption

The principal application for explosives in the United States was coal mining, accounting for about 71% of the total explosives sales for consumption (table 2). In 2011, U.S. coal production increased slightly to 993 Mt, according to preliminary data from the U.S. Energy Information Administration (EIA). Coal production in the Appalachian region remained about the same as production in 2010. In the Interior (midwest), coal production increased by 9.1%, and in the Western region of the United States, coal production decreased slightly. Three States (Wyoming, West Virginia, and Kentucky, in descending order) led the Nation in coal production, accounting for 62% of the total. These States were also the leading explosives-consuming States (U.S. Energy Information Administration, 2012a, p. 7–8).

Construction, metal mining, and quarrying and nonmetal mining each accounted for 9% of total explosives sales, and miscellaneous uses were about 2%. Wyoming, West Virginia, Kentucky, Indiana, Nevada, Virginia, Alabama, and Pennsylvania were, in descending order, the leading explosives consuming States (greater than 100,000 metric tons sold), with a combined total of 69% of U.S. sales (table 3).

Explosives are used in the mining industry and virtually every segment of the manufacturing and major construction industry; therefore, changes in the consumption of explosives will be reflected in the decrease or increase in these applications. The dollar value of new construction (residential and nonresidential) put in place in 2011 decreased by 3% compared with that in 2010 (U.S. Census Bureau, 2012). Based on monthly data, the seasonally adjusted industry growth rate from 2010 to 2011 for metal mining was 2.5%, and the growth rate for quarrying and nonmetallic mineral mining was slightly lower (Federal Reserve Board, 2012).

Classification of Industrial Explosives and Blasting Agents.—Apparent consumption of commercial explosives used for industrial purposes is defined in this report as sales as 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 2011, about 97% of the total blasting agents and oxidizers sales was in bulk form.

World Review

Australia.—Deepak Fertilisers and Petrochemicals Corp. Ltd. proposed to establish a 300,000-metric-ton-per-year (t/yr) technical-grade ammonium nitrate plant in South Australia. The estimated cost of the project was \$350 million. The feasibility study was underway on a 310-hectare site at Port Bonython, which was expected to take 12 to 15 months to complete and another 24 months was anticipated for construction (Green Markets, 2011a).

Incitec Pivot Ltd. announced that it would conduct a feasibility study for construction of a world scale ammonium nitrate plant at Kooragang Island, Newcastle, New South Wales. The plant was expected to produce ammonium nitrate for the local mining industry and export and urea ammonium nitrate solution for agricultural use. The feasibility study was expected to be completed in 2012 and, if the project proceeds, production at the plant was anticipated to begin in 2016 (Fertilizer Week, 2011b).

Incitec Pivot planned to construct a 100,000-t/yr ammonium nitrate emulsion plant in Port Hedland, Western Australia, mainly to supply iron ore mining companies in Australia. The ammonium nitrate emulsion plant was expected to cost about \$43 million and would be operational by fourth quarter of 2012 (Fertilizer Week, 2011a).

Wesfarmers Ltd. was expanding its ammonium nitrate facility at its subsidiary firm CSBP Ltd.'s Kwinana industrial complex in Western Australia by adding a nitric acid unit and ammonium nitrate plant, together with upgrading the existing prilling plant and other infrastructure work. Total cost of the expansion was \$546 million. The expansion would add 260,000 t/yr of ammonium nitrate production capacity, increasing the total production capacity to 780,000 t/yr. Expansion of the Kwinana

facility was expected to be completed by the second quarter of 2014 (Fertilizer Week, 2011d).

Vietnam.—PetroVietnam established a 60–40 joint venture with Hanoi-based General Army of Economic and Technology to build a 450,000-t/yr ammonia and 200,000-t/yr industrial-grade ammonium nitrate plant using natural gas as a feedstock. No timetable was announced for the completion of the project (Nitrogen + Syngas, 2011).

Vietnam National Coal—Minerals Industries Holding Corp. Ltd. (Vinacomin) was granted a construction license from the Thai Binh Provincial People's Committee to build an ammonium nitrate plant in Thai Thuy District at a cost of \$280 million. The planned production capacity was 200,000 t/yr of ammonium nitrate, and construction of the plant was expected to begin in November and to be completed by 2014 (Vietnam National Coal – Minerals Industries Holding Corp. Ltd., 2011).

Outlook

According to the EIA, U.S. coal production in 2012 was expected to decrease by 7% from that of 2011. In 2013, production was projected to decrease by about another 4%, a result of decreased domestic coal consumption (U.S. Energy Information Administration, 2012b, p. 10–11). Based on the coal production projections, explosives consumption was expected to decrease in 2012 and 2013 resulting from the expected associated decrease in domestic coal demand.

References Cited

- Federal Reserve Board, 2012, 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 August 9, 2012, via http://www.federalreserve.gov/releases/G17/table1_2.htm.)
- Fertilizer Week, 2011a, Incitec Pivot plans new AN emulsion plant: Fertilizer Week, v. 25, no. 6, May 13, p. 6–7.
- Fertilizer Week, 2011b, Incitec Pivot to study AN plant at Kooragang Island: Fertilizer Week, v. 25, no. 29, October 28, p. 3–4.
- Fertilizer Week, 2011c, US proposes ammonium nitrate regulations: Fertilizer Week, v. 25, no. 17, August 5, p. 4–5.
- Fertilizer Week, 2011d, Wesfarmers board gives final approval for AN expansion: Fertilizer Week, v. 25, no. 37, December 23, p. 6.
- Green Markets, 2011a, Deepak eyes Aussie TAN plant: Green Markets, v. 35, no. 14, April 4, p. 14.
- Green Markets, 2011b, New nitrogen project expects permits soon—Plant manager named: Green Markets, v. 35, no. 34, August 29, p. 15.
- Jones, Rich, 2012, US Nitrogen breaks ground for \$220-million plant: The Greenville [TN] Sun, February 18. (Accessed August 9, 2012, at http://www.greenvilleonline.com/Local_News/article/US-Nitrogen-Breaks-Ground-For-220-Million-Plant-id-318337.)
- Nitrogen + Syngas, 2011, Vietnam—PetroVietnam plans ammonium nitrate plant: Nitrogen + Syngas, no. 313, September–October, p. 12.
- U.S. Census Bureau, 2012, Annual value of construction put in place 2002–2011: U.S. Census Bureau, August 1, 2 p. (Accessed August 9, 2012, via <http://www.census.gov/construction/c30/toppage.html>.)
- U.S. Department of Homeland Security, 2011, Ammonium nitrate security program: Federal Register, v. 76, no. 149, August 3, p. 46908–46957.
- U.S. Energy Information Administration, 2012a, Quarterly coal report—October–December 2011: U.S. Energy Information Administration, March, DOE/EIA–0121 (2011/04Q), 54 p.
- U.S. Energy Information Administration, 2012b, Short-term energy outlook: U.S. Energy Information Administration, August, 45 p. (Accessed August 10, 2012, at <http://www.eia.gov/forecasts/steo/report/coal.cfm>.)
- Vietnam National Coal – Minerals Industries Holding Corp. Ltd., 2011, Start the ammonium nitrate project with capacity of 200 thousand tons per year:

TABLE 1
SALIENT STATISTICS OF INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS SOLD FOR CONSUMPTION IN THE UNITED STATES¹

(Metric tons)

Class	2010	2011
Permissibles	990	1,020
Other high explosives	22,600	21,900
Blasting agents and oxidizers	2,650,000	2,980,000
Total	2,680,000	3,000,000

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

Source: Institute of Makers of Explosives.

TABLE 2
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
2010:						
Permissibles	1	(3)	(3)	(3)	--	1
Other high explosives	3	8	1	10	1	23
Blasting agents and oxidizers	1,880	244	225	236	66	2,650
Total	1,890	252	226	246	67	2,680
2011:						
Permissibles	1	(3)	(3)	(3)	--	1
Other high explosives	3	7	1	10	1	22
Blasting agents and oxidizers	2,120	272	257	255	74	2,980
Total	2,130	279	258	265	75	3,000

-- Zero.

¹Distribution 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.

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

³Less than ½ unit.

TABLE 3
INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS SOLD FOR CONSUMPTION IN THE UNITED STATES, BY STATE AND CLASS¹

(Metric tons)

State	2010				2011			
	Fixed high explosives		Blasting agents and oxidizers	Total	Fixed high explosives		Blasting agents and oxidizers	Total
	Permissibles	Other high explosives			Permissibles	Other high explosives		
Alabama	37	191	91,800	92,000	7	225	103,000	103,000
Alaska	--	724	13,300	14,100	--	729	16,200	17,000
Arizona	15	273	39,200	39,500	15	270	56,700	57,000
Arkansas	--	100	19,600	19,800	--	72	15,200	15,200
California	--	352	23,400	23,700	--	414	24,700	25,200
Colorado	14	406	62,500	62,900	37	462	60,300	60,800
Connecticut	--	147	3,560	3,710	--	115	3,490	3,610
Delaware	--	--	--	--	--	--	--	--
Florida	--	77	13,300	13,300	--	62	10,400	10,500
Georgia	--	429	18,200	18,600	--	216	17,800	18,000
Hawaii	--	--	478	478	--	(3)	258	258
Idaho	1	58	11,600	11,600	--	47	16,300	16,300
Illinois	7	370	41,100	41,400	--	368	55,400	55,800
Indiana	--	1,410	159,000	160,000	4	793	202,000	203,000
Iowa	6	609	19,600	20,200	--	616	22,000	22,700
Kansas	--	82	11,600	11,700	--	91	11,000	11,100
Kentucky	182	1,400	281,000	283,000	130	1,540	295,000	297,000
Louisiana	--	238	2,670	2,910	--	1,440	2,950	4,400
Maine	--	190	2,890	3,080	--	170	3,050	3,220
Maryland ²	11	463	14,800	15,200	2	80	16,000	16,100
Massachusetts	--	103	4,280	4,390	--	97	5,010	5,110
Michigan	--	92	25,400	25,400	--	81	18,800	18,800
Minnesota	--	103	83,900	84,000	--	112	87,800	87,900
Mississippi	--	39	(3)	40	--	31	(3)	32
Missouri	3	1,430	61,300	62,700	147	1,390	70,300	71,900
Montana	--	1,570	54,200	55,800	--	2,030	56,000	58,000
Nebraska	--	88	2,330	2,420	--	112	2,600	2,710
Nevada	327	1,060	115,000	116,000	226	784	130,000	131,000
New Hampshire	--	129	3,150	3,280	--	120	3,310	3,430
New Jersey	--	66	3,990	4,060	--	82	5,780	5,860
New Mexico	--	130	24,200	24,300	--	126	32,900	33,000
New York	(3)	555	13,400	13,900	--	781	14,600	15,400
North Carolina	--	313	17,800	18,100	--	318	16,900	17,300
North Dakota	--	10	2,610	2,620	--	9	3,050	2,060
Ohio	(3)	364	49,000	49,400	(3)	381	52,100	52,400
Oklahoma	--	747	20,800	21,600	1	140	23,200	23,300
Oregon	5	178	5,320	5,510	--	268	6,680	6,950
Pennsylvania	36	1,290	99,300	101,000	63	1,350	100,000	102,000
Rhode Island	--	31	1,360	1,390	--	24	988	1,010
South Carolina	--	76	5,420	5,500	--	96	6,490	6,590
South Dakota	--	23	7,160	7,180	--	7	4,470	4,480
Tennessee	--	2,440	28,300	30,800	10	1,420	25,900	27,300
Texas	--	994	33,900	34,900	--	967	61,800	62,800
Utah	37	302	62,800	63,100	46	542	72,000	72,500
Vermont	4	67	1,760	1,830	4	55	2,060	2,120
Virginia	119	817	113,000	114,000	181	749	114,000	115,000
Washington	43	630	18,500	19,200	18	674	15,300	15,900
West Virginia	138	806	334,000	335,000	128	826	342,000	343,000
Wisconsin	5	329	9,810	10,100	--	282	10,900	11,200
Wyoming	(3)	314	623,000	623,000	--	355	763,000	764,000
Total	990	22,600	2,650,000	2,680,000	1,020	21,900	2,980,000	3,000,000

-- Zero.

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

²Includes the District of Columbia.

³Less than ½ unit.

Source: Institute of Makers of Explosives.