

# EXPLOSIVES

By Deborah A. Kramer

**Domestic survey tables were prepared by Feri Naghdi, statistical assistant.**

In 1999, U.S. explosives production was 2.12 million metric tons (Mt), a 27% decrease from that of 1998; sales of explosives were recorded in all States. Coal mining, with 67% of total consumption, continued to be the dominant use for explosives in the United States. Kentucky, West Virginia, Virginia, Nevada, and Pennsylvania, in descending order, were the largest consuming States, with a combined total of 50% of U.S. sales. Based on projected increases in coal production in 2000 and 2001, explosives demand also is expected to increase. In addition, a projected increase in the production of construction aggregates also could lead to increased demand for explosives in the next few years.

## Legislation and Government Programs

LaRoche Industries Inc. reportedly agreed to pay \$3 to \$3.75 million to mining firms over a 5-year period in a settlement of antitrust lawsuits that were filed in 1997. According to the lawsuits, LaRoche and other explosives-grade ammonium nitrate manufacturers violated antitrust regulations regarding industry pricing policies (Green Markets, 1999).

In August, the U.S. Court of Appeals (Third Circuit) affirmed a lower court's 1997 decision to dismiss the case brought against Dyno Nobel Inc., Arcadian Corp., and Hydro Agri North American Inc. regarding the World Trade Center bombing in New York in 1993. The suit had been brought by the Port Authority of New York and New Jersey alleging that the companies had sold fertilizer materials that were ultimately purchased by terrorists and used to create a bomb. The Court of Appeals affirmed that the companies' actions in selling the fertilizer products were not the cause of the bombing, and that they had no legal duty to anticipate and prevent the use of fertilizer products as part of a terrorist device (Dyno ASA, September 14, 1999, Final dismissal of World Trade Center bombing case, accessed June 14, 2000, via URL <http://www.dynoasa.com/dynoweb/dynofram.nsf/pages/dynonews>).

## Production

Ammonium-nitrate-based explosives (blasting agents and oxidizers) sales were 2.09 Mt, a 28% decrease from that of 1998, and accounted for 98% of U.S. industrial explosives sales. Production of permissibles declined, but production of other high explosives increased (table 1). Figure 1 shows how sales for consumption have changed since 1990.

Companies contributing data to this report, including those that are not members of the Institute of Makers of Explosives (IME), are as follows (nonmembers are denoted by an asterisk):

Accurate Energetic Systems LLC  
Apache Nitrogen Products Inc. \*  
Austin Powder Co.  
Baker Atlas International  
Coastal Chem Inc. \*  
Daveyfire Inc.  
Douglas Explosives Inc.  
Dyno Nobel Inc.  
El Dorado Chemical Co.  
The Ensign-Bickford Co.  
Explosives Technologies International Inc. (ETI)  
D.C. Guelich Explosives Co.  
HITECH Inc.  
Jet Research Center  
LaRoche Industries Inc. \*  
Mining Services International Corp.  
W.A. Murphy Inc.  
Nitram Inc. \*  
Nelson Brothers Inc.  
Nitrochem Corp.  
Orica USA  
Owen Oil Tools Inc.  
PCS Nitrogen Corp. \*  
St. Lawrence Explosives Corp.  
Schlumberger Perforating Center  
Senex Explosives Inc.  
Slurry Explosives Corp.  
Unocal Corp. \*  
Viking Explosives and Supply Co.

## Consumption

Coal mining, with 67% of total explosives consumption, remained the largest application for explosives in the United States. According to the U.S. Department of Energy (DOE), in 1999, coal production declined to 992 Mt, about 2.1% less than the record-high level in 1998 (F.L. Freme, and B.D. Hong, 2000, U.S. coal supply and demand—1999 review, accessed June 12, 2000, via URL <http://www.eia.doe.gov/fuelcoal.html>). This decrease in coal production was attributed to a large decline in coal exports (25% less than those in 1998), an increase in nuclear power generation at the expense of coal-fired electric powerplants, and the unseasonably mild winter weather.

Wyoming, West Virginia, and Kentucky, in descending order, led the Nation in coal production, accounting for 58% of the total, and were among the largest explosives-consuming States, accounting for 33% of total U.S. explosives sales.

Quarrying and nonmetal mining, the second-largest consuming industry, accounted for 14% of total explosives sales; metal mining, 10%; construction, 7%; and miscellaneous uses,

3% (table 2). Kentucky, West Virginia, Virginia, Nevada, and Pennsylvania, in descending order, were the largest consuming States, with a combined total of 50% of U.S. sales (table 3).

According to U.S. Census Bureau statistics, the value of new construction increased by 2.0%, on the basis of constant 1992 dollars (U.S. Department of Commerce, 2000, Value of construction put in place, accessed June 13, 2000, at URL <http://www.census.gov/prod/2000pubs/c30-9912.pdf>). Federal Reserve Board indexes indicated that the industry growth rate for metal mining from 1998 to 1999 was -0.9% and that the growth rate for stone and earth minerals was -5.0% (Federal Reserve Board, 1999, Industrial production and capacity utilization, Federal Reserve Statistical Release G17, accessed June 13, 2000, at URL <http://www.bog.frb.fed.us/releases/G17/Revisions/19991130/>).

**Classification of Industrial Explosives and Blasting Agents.**—Apparent consumption of commercial explosives used for industrial purposes in this report is defined as sales as reported to the IME. Commercial explosives imported for industrial uses were 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 approved grades by brand name, as established by National Institute of Occupational Safety and Health (former U.S. Bureau of Mines) testing.

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

**Blasting Agents and Oxidizers.**—These include (1) ammonium nitrate-fuel oil (ANFO) mixtures, regardless of density, (2) slurries, water gels, or emulsions, (3) ANFO blends containing slurries, water gels, or emulsions, and (4) ammonium nitrate in prilled, grained, or liquor (water solution) form. Bulk and packaged forms of these materials are contained in this category. In 1999, about 92% of the total blasting agents and oxidizers was in bulk form.

## World Review

Australia's Orica Ltd. is establishing a significant presence throughout the world as one of the largest explosives manufacturers. After Imperial Chemical Industries Ltd. (ICI) sold its majority shareholding in ICI Australia in 1997 to create an independent company, ICI Australia changed its name to Orica in 1998. Since then, the company has invested in explosives manufacturing facilities throughout the world. In 1998, the company acquired a controlling interest in one of Thailand's large explosives companies, Chai Development Co. Ltd., and a 49% interest in Emirates Explosives LLC, a Dubai-based explosives firm that sells to the local quarry, oil exploration, and construction markets (Orica Ltd., May 22, 1998, Orica acquires Thai interest in latest strategic explosives expansion, accessed June 12, 2000, via URL <http://www.orica.com.au/>; Orica Ltd., October 28, 1998, Orica acquires share of

Dubai explosives business, accessed June 12, 2000, via URL <http://www.orica.com.au/>).

Also in 1998, Orica and Mexico's Grupo Acerero del Norte S.A. de C.V. (GAN) announced a joint venture to manufacture and sell ammonium nitrate. The joint venture, which involved a \$25 million investment by Orica, brought GAN's existing 270,000-metric-ton-per-year (t/yr) ammonium nitrate plant in Coatzacoalcos, Veracruz, together with Orica's existing 65,000-t/yr plant in Monclova, Coahuila. Production capacity at the Coatzacoalcos plant was increased to 360,000 t/yr in the first quarter of 1999. The industrial-grade ammonium nitrate will be marketed to agricultural industries in Mexico and to export markets in Central and South America and the Caribbean (Orica Ltd., July 22, 1998, Joint Orica and GAN announcement - ammonium nitrate joint venture in Mexico, accessed June 12, 2000, via URL <http://www.orica.com.au/>).

In 1999, Orica finalized a joint venture with ICI India, a subsidiary of ICI, to manufacture and sell explosives to the Indian market. As part of the joint venture, named India Explosives Ltd., all of ICI India's assets were transferred to the new company. As a result, India Explosives assets include a manufacturing site at Gomia, Bihar State, and two other bulk emulsion manufacturing sites. Orica owns 49% of the joint venture, and ICI India owns the remaining 51% (Orica Ltd., October 1, 1999, Orica creates new potential for explosives business, accessed June 12, 2000, via URL <http://www.orica.com/au/>).

Orica also formed a joint venture with the U.S. firm Nelson Brothers Inc. to service customers in western U.S. markets. The joint venture will be known as Nelson Brothers Mining Services and will incorporate the major assets and operations of the two companies' surface mining businesses in Montana, North Dakota, South Dakota, and Wyoming (Orica Ltd., October 1, 1999, Orica creates new potential for explosives business, accessed June 12, 2000, via URL <http://www.orica.com/au/>).

Orica received a 3-year A\$120 million contract to supply explosives services to 70% of Rio Tinto Group's Australian operations. The operations included in the contract are the Argyle diamond mine, Western Australia; Rio Tinto Coal, New South Wales; and the Peak gold mine, New South Wales. The contract includes bulk explosives, downhole services, initiating explosives, and technical expertise (Orica Ltd., August 31, 1999, Orica wins contract with global mining house: \$120 million agreement to support Rio Tinto in Australia, accessed June 26, 2000, via URL <http://www.orica.com/au/>).

In April 1999, Orica broke off talks with South Africa's AECI Ltd. about the potential purchase of AECI's explosives business, African Explosives Ltd. Reportedly, the two companies could not agree on a price. Earlier, AECI had been in talks with Norway's Dyno ASA. As a result of the failed purchases, African Explosives planned to continue to operate as a subsidiary of AECI (African Explosives Ltd., April 13, 1999, AECI Explosives Limited to go it alone, Graham Edwards appointed as Managing Director, accessed June 26, 2000, at URL <http://www.explosives.co.za/default2.htm>).

Norway's Dyno, through its Dyno Nobel del Peru subsidiary, formed a joint venture with a Peruvian firm, DeCol Engineering, to acquire 60% ownership in an ammonium nitrate facility near

Lima. The 50,000-t/yr facility has been out of service for some time and became available through the privatization of the former State-owned enterprise, Fertilizantes Sinteticos S.A. The joint venture plans to restart the plant, with production scheduled to begin in October 1999. Most of the ammonium nitrate will be marketed to the copper and gold mining industries (Dyno ASA, June 8, 1999, Dyno announces purchase of Peruvian ammonium nitrate plant, accessed June 13, 2000, via URL <http://www.dynoasa.com/dynoweb/dynofram.nsf/pages/dynonews>).

In November, Empresa Nacional de Explosivos (Enaex) completed its 240,000-t/yr explosives-grade ammonium nitrate plant in Mejillones, Chile. This is Enaex's third ammonium nitrate plant in northern Chile; the existing plants can produce up to 110,000 t/yr. Ammonia for the plants is purchased under a long-term agreement with Transammonia (Fertilizer Week, 1999).

### **Outlook**

The DOE projects a 1.6% increase in coal production in 2000 and a 1.5% increase in production in 2001. All of the production increase is projected to come from the Western Region. Decreases in production are projected to occur in the Appalachian and Interior Regions for 2000 and 2001. (U.S. Department of Energy, June 6, 2000, Short-term energy outlook, accessed June 22, 2000, at URL <http://www.eia.doe.gov/emeu/>

[steo/pub/highlights.html](http://www.eia.doe.gov/emeu/steo/pub/highlights.html)). If these projections are correct, then explosives consumption should increase slightly in each of these years. Because the increase in coal production is forecast for the Western Region, explosives consumption is not expected to increase at the same pace; the lower overburden-to-matrix ratio in the Western Region will lead to a slower growth in explosives consumption. Aberrations in weather patterns, however, could have a substantial impact on U.S. coal demand, because most of it is used for electricity production; changes in coal demand obviously will have an impact on the explosives demand in the United States.

Another factor that may increase U.S. demand for explosives is the projected increase in production of construction aggregates. Gradual increases in demand for construction aggregates are anticipated after 1999 on the basis of the expected volume of work on the U.S. infrastructure that will be financed by the new Transportation Equity Act for the 21<sup>st</sup> Century and the U.S. economy in general. The projected increases will be influenced by construction activity in the public and private construction sectors.

### **References Cited**

- Fertilizer Week, 1999, Enaex poised to start new EGAN plant: Fertilizer Week, v. 13, no. 25, November 1, p. 2.  
Green Markets, 1999, [Untitled]: Green Markets, v. 10, no. 2, July 26, p. 4.

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

(Metric tons)

Class	1998	1999
Permissibles	2,740 r/	1,800
Other high explosives	30,400	31,100
Blasting agents and oxidizers	2,880,000 r/	2,090,000
Total	2,910,000 r/	2,120,000

r/ Revised.

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  
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
1998:						
Permissibles	3 r/	(3/)	--	(3/)	--	3 r/
Other high explosives	4	14	1	10	2	30
Blasting agents and oxidizers	1,930	399 r/	274 r/	198 r/	78 r/	2,880 r/
Total	1,940	412 r/	275 r/	208 r/	80 r/	2,910 r/
1999:						
Permissibles	2	(3/)	(3/)	(3/)	--	2
Other high explosives	4	14	1	11	1	31
Blasting agents and oxidizers	1,400	277	202	147	58	2,090
Total	1,410	291	203	157	59	2,120

r/ Revised. -- 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 1/2 unit.

TABLE 3  
INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS SOLD FOR CONSUMPTION  
IN THE UNITED STATES, BY STATE AND CLASS 1/

(Metric tons)

State	Class							
	1998				1999			
	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	72	763	116,000	117,000	43	823	91,600	92,500
Alaska	--	533	12,000 r/	12,600 r/	--	32	3,770	3,800
Arizona	16	434	128,000	128,000	--	414	109,000	109,000
Arkansas	--	191	11,900	12,100	--	180	8,010	8,190
California	1	791 r/	36,400 r/	37,200 r/	5	720	33,700	34,400
Colorado	44	621	34,300 r/	35,000 r/	103	2,310	40,900	43,300
Connecticut	--	946	10,000	11,000	--	1,990	8,000	9,990
Delaware	--	4	152	156	--	2	96	98
Florida	--	123	7,460	7,590	--	224	8,740	8,970
Georgia	--	605	35,400	36,000	--	685	41,700	42,400
Hawaii	--	1	1,250	1,250	--	9	1,140	1,150
Idaho	--	588	9,860 r/	10,400 r/	21	462	7,590	8,070
Illinois	(2/) r/	367	43,400	43,700	--	2,000	43,500	45,500
Indiana	1	691	193,000 r/	194,000 r/	1	381	33,900	34,200
Iowa	--	704	18,400	19,100	--	744	17,300	18,100
Kansas	--	463	15,900	16,300	--	303	16,900	17,200
Kentucky	1,040	2,350 r/	482,000 r/	485,000 r/	975	2,460	408,000	411,000
Louisiana	--	248	1,890	2,140	--	136	2,040	2,180
Maine	--	22	335	357	--	146	517	663
Maryland 3/	--	406	8,130	8,540	(2/)	95	4,770	4,870
Massachusetts	--	695	3,180	3,880	--	403	2,390	2,790
Michigan	-- r/	132	31,000	31,100	--	59	9,930	9,990
Minnesota	--	178	83,100	83,200	--	142	45,200	45,400
Mississippi	--	327	1,500	1,820	--	407	6,640	7,050
Missouri	--	1,130	32,400 r/	33,500 r/	2	1,490	45,500	47,000
Montana	--	123	32,100 r/	32,200 r/	19	119	29,400	29,500
Nebraska	--	74	1,950	2,030	--	90	1,770	1,860
Nevada	277 r/	1,640	189,000 r/	190,000 r/	4	1,300	124,000	125,000
New Hampshire	107 r/	1,320	4,020 r/	5,450 r/	--	598	5,190	5,790
New Jersey	(2/) r/	222	6,750	6,980	--	171	6,280	6,450
New Mexico	--	288	91,400	91,600	--	123	33,900	34,000
New York	149	439	16,000	16,600	3	605	11,800	12,400
North Carolina	--	900	43,000	43,900	--	1,320	44,800	46,100
North Dakota	1 r/	24	492 r/	517 r/	--	6	1,860	1,860
Ohio	5	533	81,100	81,700	5	477	69,800	70,300
Oklahoma	3	333	23,500	23,900	1	202	20,300	20,500
Oregon	--	246	8,900	9,150	--	180	5,280	5,460
Pennsylvania	179	2,910	114,000 r/	118,000 r/	98	3,280	110,000	114,000
Rhode Island	--	2	862	864	--	17	80	96
South Carolina	--	125	10,700	10,800	--	126	9,070	9,200
South Dakota	--	43	5,340	5,380	--	33	3,370	3,400
Tennessee	6	1,210 r/	44,500 r/	45,700 r/	3	730	45,500	46,300
Texas	-- r/	924	37,600	38,500	(2/)	420	28,400	28,800
Utah	433	570	44,700	45,700	138	764	33,800	34,700
Vermont	10	175	308	492	6	39	518	562
Virginia	279 r/	1,120 r/	245,000 r/	247,000 r/	250	1,700	194,000	196,000
Washington	--	562	14,800	15,300	--	1,040	10,700	11,700
West Virginia	123 r/	1,190 r/	259,000 r/	260,000 r/	121	609	214,000	214,000
Wisconsin	--	450	13,300	13,700	--	320	11,000	11,300
Wyoming	--	1,620	274,000 r/	275,000 r/	4	233	81,400	81,700
Total	2,740 r/	30,400 r/	2,880,000 r/	2,910,000 r/	1,800	31,100	2,090,000	2,120,000

r/ Revised. -- Zero.

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

2/ Less than 1/2 unit.

3/ Includes the District of Columbia.

Source: Institute of Makers of Explosives.

FIGURE 1  
SALES FOR CONSUMPTION OF U.S. INDUSTRIAL EXPLOSIVES

