EXPLOSIVES

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In 2000, U.S. explosives production was 2.57 million metric tons (Mt), a 21% increase from that of 1999; sales of explosives were reported in all States. Coal mining, with 67% of total consumption, continued to be the dominant use for explosives in the United States. Kentucky, Virginia, Wyoming, West Virginia, and Pennsylvania, in descending order, were the largest consuming States, with a combined total of 51% of U.S. sales.

Legislation and Government Programs

On October 13, the Committee for Fair Ammonium Nitrate Trade filed a petition with the U.S. International Trade Commission (ITC) alleging that ammonium nitrate from Ukraine was being sold in the United States at less than fair value. As a result, the ITC began an antidumping investigation of imports of ammonium nitrate from Ukraine and determined that there was a reasonable indication that the domestic industry was being injured (U.S. International Trade Commission, 2000, p. 1-19). The International Trade Administration (ITA) of the U.S. Department of Commerce began its investigation into the antidumping allegation in November and made a preliminary determination in March 2001. According to the ITA's investigation, the estimated dumping margin for J.S.C. "Concern" Stirol was 113.38% ad valorem. The Ukraine-wide rate, which was applicable to all other producers and exporters, was also 113.38%. The ITA also determined that critical circumstances existed. A final determination was set to be completed 105 days after the notice was published in the Federal Register (U.S. Department of Commerce, 2001).

The Bureau of Alcohol, Tobacco and Firearms (ATF) of the U.S. Department of the Treasury was considering amending its regulations to require licensed importers of explosive materials to place the same identification marks on imported explosive materials that are required on explosive materials that are manufactured in the United States. The Institute of Makers of Explosives (IME), who initiated the request, expressed concern that the unidentified explosives could pose a significant safety and security hazard. The ATF was requesting comments from the public regarding the proposed change; comments were due by January 12, 2001 (U.S. Bureau of Alcohol, Tobacco and Firearms, 2000).

Production

Sales of ammonium-nitrate-based explosives (blasting agents and oxidizers) were 2.53 Mt, a 21% increase from that of 1999, and accounted for 99% 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 1991.

Because of the sharp decrease in U.S. explosives production from 1998 to 1999, followed by a corresponding sharp increase from 1999 to 2000, the 1999 data appear to be anomalous. Because coal production is the principal driver of explosives consumption, the sharp changes in explosives sales in these years would be expected to be reflected by a corresponding change in coal production. This, however, was not the case. From 1998 to 1999, U.S. coal production declined by about 1.5%. This small decrease was not enough to cause a decline of 28% in explosives sales. This anomaly is particularly evident in the sales to Wyoming where explosives sales declined by 70% from 1998 to 1999, yet coal production in the State actually increased by 7%. These sharp drops in explosives sales from 1998 to 1999 were followed by sharp increases from 1999 to 2000, again without a corresponding change in coal production. This would indicate that there were significant reporting errors in 1999.

Companies contributing data to this report, including those that are not members of the 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.
General Dynamics OTS Hitech Inc.
Jet Research Center
LaRoche Industries Inc. *
Mining Services International Corp.
W.A. Murphy Inc.
Nelson Brothers Inc.
Nitram Inc. *
Nitrochem Corp.
Orica USA Inc.
Owen Oil Tools Inc.
PCS Nitrogen Corp. *
St. Lawrence Explosives Corp.
Schlumberger Perforating Center
Senex Explosives Inc.
Slurry Explosives Corp.
Vet's Explosives
Viking Explosives and Supply Co.

LaRoche Industries Inc. filed for chapter 11 bankruptcy in May. In August, LaRoche announced the sale of its ammonium nitrate facilities in Alabama, Illinois, Missouri, and Utah to Orica LLC, a unit of Orica Ltd., an international manufacturer and distributor of explosives. After the U.S. Bankruptcy Court in Delaware approved the sales, Orica then sold the Cherokee, AL, and Crystal City, MO, facilities to LSB Industries Inc., which planned to operate these facilities under its El Dorado Chemical Co. subsidiary (Green Markets, 2000).

Dyno Nobel Inc. and Orica USA Inc. established a joint-venture manufacturing company, Geneva Nitrogen Inc., to operate the Geneva, UT, industrial-grade ammonium nitrate facility that Orica acquired from LaRoche Industries. Through the joint venture, both companies will own 50% of the plant, as well as one-half of the associated production volume of 100,000 metric tons per year (t/yr). Each company planned to market its 50% portion of the produced volume separately (Dyno Nobel ASA, November 2, 2000, Dyno Nobel forms US nitrogen plant jv, accessed February 6, 2001, via URL http://www.dynonobel.com/dninternet/home1.nsf).

In February, ICI Explosives USA Inc. sold its remaining ammonium nitrate production facilities in Joplin, MO, to Joplin Manufacturing Inc., which is a unit of Orica, for approximately $5.2 million. Orica was committed to purchasing the output of the plants for 4 years as part of the original international explosives acquisition from ICI plc in May 1998 (ICI plc, February 24, 2000, ICI sells US explosives plants to ORICA, accessed June 13, 2000, via URL http://www.ici.com/pressoffice).

Consumption

Coal mining, with 67% of total explosives consumption, remained the largest application for explosives in the United States. According to the U.S. Energy Information Administration of the U.S. Department of Energy (DOE), for the first time in 40 years, coal production declined for 2 years in a row and reached 976 Mt, about 2.3% less than that in 1999 (Fred Freme, 2001, U.S. coal supply and demand—2000 review, accessed June 1, 2001, at URL http://www.eia.doe.gov/fuelcoal.html). The production decline was attributed to a drawdown in stocks and a lack of excess production capacity at some mines.

Wyoming, West Virginia, and Kentucky, in descending order, led the Nation in coal production, accounting for 59% of the total, and were among the largest explosives-consuming States, accounting for 37% of total U.S. explosives sales.

Quarrying and nonmetal mining, the second-largest consuming industry, accounted for 14% of total explosives sales; metal mining, 9%; construction, 8%; and miscellaneous uses, 2% (table 2). Kentucky, Virginia, Wyoming, West Virginia, and Pennsylvania, in descending order, were the largest consuming States, with a combined total of 51% of U.S. sales (table 3).

The value of new construction increased by 1.7%, based on constant 1996 dollars (U.S. Census Bureau, 2001, Value of construction put in place, accessed June 20, 2001, at URL http://www.census.gov/prod/ 2001pubs/c30-0103.pdf). Federal Reserve Board indices indicated that the industry growth rate for metal mining from 1999 to 2000 was -4.2% and that the growth rate for stone and earth minerals was -1.8% (Federal Reserve Board, 2000, Industrial production and capacity utilization—Federal Reserve statistical release G17, accessed June 20, 2001, at URL http://www.federalreserve.gov/releases/G17/Revisions/20001205/table6.txt).

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 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 2000, about 93% of the total blasting agents and oxidizers was in bulk form.

World Review

Australia.—Dyno Nobel officially opened its Queensland Nitrates Pty. Ltd. facility in October. The $240 million complex has the capacity to produce 180,000 t/yr of ammonium nitrate. Much of the plant's output was expected to be marketed to the local coal-mining industry and to complement Dyno Nobel's other manufacturing facilities in the area—its explosives plant at Bajool and its detonator assembly facility at Helidon (Dyno Nobel ASA, October 6, 2000, Opening of Dyno Nobel AN complex, accessed February 6, 2001, at URL http://www.dynonobel.com/dninternet/home1.nsf).

Europe.—Orica announced that it would form a joint venture with Accept Corp. of Kazakhstan to manufacture and market explosives in Kazakhstan. The joint venture will be called Orica Kazakhstan, and Orica would own 80% of the company, and Accept, the remaining 20%. Orica Kazakhstan would be the first modern explosives manufacturer to be established in the country. The $100 million per year explosives requirements of Kazakhstan's mining industry have been supplied by imports, predominantly from Russia (Orica Ltd., May 18, 2000, Orica establishes Kazakhstan venture, accessed June 12, 2000, via URL http://www.orica.com/business/cor/wcor00009.nsf/webnav2/News+Releases?OpenDocument).

In October, Orica announced that it had signed a letter of intent to acquire the German firm Dynamit Nobel AG for about $38.2 million. The acquired business includes manufacturing sites at Troisdorf and Wurgendorf in Germany and Sirgala in Estonia. In addition, Dynamit Nobel is a major manufacturer of detonators for commercial explosives with production facilities at Troisdorf. The acquisition also would give Orica full ownership of Precision Blasting Systems GmbH, a joint venture formed in 1999 with Dynamit Nobel to develop and manufacture electronic detonator systems based on the combined technology of both companies (Orica Ltd., August 31, 2000, Orica planning European explosives acquisition, accessed February 6, 2001, via URL http://www.orica.com/business/cor/wcor00009.nsf/webnav2/News+Releases?OpenDocument).

Kimit AB and Orica signed a letter of intent to form a joint venture to manufacture, supply, and distribute commercial explosives in the Nordic countries. The joint venture was expected to have initial sales of approximately $3.6 million. Orica Europe Ltd. would hold 51% and Kimit would hold 49% of the shares of the new company (Orica Ltd., October 9, 2000, Orica and Kimit to form Scandinavian explosives venture, accessed March 13, 2001, via URL http://www.orica.com/business/cor/wcor00009.nsf/webnav2/News+Releases?OpenDocument).

South America.—Orica formed a joint-venture company with Merand Group in Venezuela in order to increase its participation in the Venezuelan explosives market. The joint-venture company was expected to operate under the name Orica Venezuela C.A. The new company signed an agreement with Compañía Anónima Venezolana de Industrias Militares (CAVIM), a state-owned company that regulates the manufacture of industrial explosives in Venezuela, to build and operate a plant to supply CAVIM with the bulk explosives needs of its customers for at least the next 5 years. Orica estimated that the Venezuelan market for industrial explosives has a value of about Australian $35 million and was expected to grow at around 10% per year (Orica Ltd., April 27, 2000, Orica forms new company in Venezuela, accessed June 12, 2000, via URL http://www.orica.com/business/cor/wcor00009.nsf/webnav2/News+Releases?OpenDocument). Orica's existing Latin American explosives interests in the Americas include manufacturing operations in Argentina, Brazil, Chile, and Mexico.

Current Research and Technology

After at least 20 years of efforts, scientists at the University of Chicago synthesized the compound octocubane ($C_8N_8O_{16}$). Octocubane consists of a cube of eight carbon atoms with nitro (NO_2) groups attached to each carbon atom. This material could be one of the most powerful explosives developed. It could be twice as powerful as trinitrotoluene (TNT), and it is thought to be 20% to 25% more energetic than High-Melting eXplosive (HMX), one of the most powerful military explosives in use today. Unlike these materials, however, octocubane is shock insensitive, which means it is much safer to handle. In addition, octocubane should burn into carbon dioxide and nitrogen, which, unlike some other explosive materials residues, should not harm the environment. Scientists at the Naval Research Laboratory are investigating the structural, electronic, and vibrational properties of octocubane (Wu, 2000).

The Defense Advanced Research Projects Agency developed a prototype system that can detect plastic landmines containing TNT in the field. The prototype is based on quadrupole resonance technology that uses an externally applied radio-frequency, magnetic-field pulse at a frequency that is specific to individual explosive compounds. When the pulse is aimed at the ground, it excites the molecules of any explosives present, generating a characteristic response that can be measured and analyzed by the system. In a test, the prototype detected all of the antipersonnel and antitank landmines with no false alarms. Based on these results, the U.S. Army and the U.S. Marine Corps were initiating programs to develop the system for field use (Defense Advanced Research Projects Agency, 2000).

Chemical Detection Technologies Inc. developed a new device that the company claimed could clear 500 to 2,000 square meters of land per hour of landmines, a process that can take 2 to 3 days with humans and trained dogs. The device uses low-energy x rays that make nitrates in the soil fluoresce; this fluorescence is captured by a specially designed germanium detector. The spectroscopic emission band of the nitrates is compared with the spectroscopic emissions of known explosives to determine its type. Although nitrates that are found naturally in the soil and nitrates from fertilizers will also fluoresce, their chemical signatures are different from those of the explosives in landmines, and the device should not be confused. The new device has been through preliminary field tests in Croatia, and the company planned to complete more testing (Photonics Spectra, 2000b).

The U.S. Navy was testing two new systems to accurately detect mines underwater. The two systems produce video images of mines at near television resolution in real time; one detects mines at or near the water's surface, the other detects mines on the bottom. The technology uses a laser, a streak-tube receiver (similar to a photomultiplier tube), and conventional digital recording technology. When the laser detects an image, it is captured by the streak tube and digitally recorded. Successive images are processed into a three-dimensional image. A human operator is still required to determine which image is that of a mine. Although the new technology is fast, offers higher resolution, and is more rugged than conventional mine-detection systems, it only covers a small area at a time. Because of this problem, the new technology will probably be used as an adjunct to traditional methods in specific trouble areas (Photonics Spectra, 2000a).

Through its Sandia National Laboratories, the DOE was undertaking several research projects on explosives technology. In one of the projects, Sandia was investigating methods of treating water saturated with organic explosives such as TNT and cyclotrimethylenetrinitramine (RDX), which is typical of water that would be generated at explosives-producing plants. The objective is for the treated water to meet U.S. Environmental Protection Agency requirements for discharge into sanitary sewers or to be able to be recycled for further use in processing explosives. Sandia scientists conducted a series of experiments that used different combinations of ultraviolet light, a catalyst (titanium dioxide in most cases), oxidants (hydrogen peroxide or ozone), and biodegradation (decomposition by bacteria). They applied these treatments in various combinations, studying the potential of photocatalysis both as a single-treatment process and as a pretreatment to biodegradation. The researchers found that when photocatalysis preceded biodegradation, both explosives decomposed to near-zero toxicity. Future work was projected to include optimizing the process variables and constructing a pilot plant (Sandia National Laboratories, [undated], Wastewater treatment, accessed June 15, 2001, at http://www.sandia.gov/explosive/projects/pinkwater.htm).

Also at Sandia, researchers are working with entomologists from the University of Montana to determine if foraging bees can be used to detect buried landmines. In many developing countries, thousands of acres of land lie unused because farmers are afraid to work their fields fearing buried landmines. As bees forage for nectar and pollen, they attract particles of dust, soil, and pollen to their bodies and bring samples back to the hive. In doing so, they provide a chemical survey of an area extending a mile or more from the hive in all directions. The research team is establishing two bee colonies in a remote test area that has many buried mock landmines. The colonies will live in highly instrumented "honeybee condos" that automatically count the number of times bees fly in and out of the hive, to track the bees flight activity. Pollen, dust, air, and other samples collected by the bees and brought to the hives will be analyzed for trace amounts of explosives. Two other control colonies will be established to provide baseline data for comparison. The entomology team has demonstrated that by providing a new bee colony with feeders tainted with a marker chemical, then gradually moving the feeders farther from the hive and eventually removing them, bees can be trained to forage wherever they smell the chemical. If bees can be trained to seek TNT, the team may attach small diodes onto the backs of several hundred TNT-trained bees. Then, using a handheld radar tracking device, they will chart where those bees go to determine whether they tend to forage near the locations of known landmines (Sandia National Laboratories, [undated], Sandia, University of Montana researchers try training bees to find buried landmines, accessed June 15, 2001, at URL http://www.sandia.gov/explosive/projects/minebees.htm).

Sandia is helping to develop a portable mine-detection system that incorporates ion mobility spectrometry, which is the same technology that is used to check airline passengers. This technology is expected to be capable of quickly detecting and classifying minute quantities of explosive molecules. The system incorporates a new Sandia-developed concentration technology that potentially can chemically amplify the source strength thousands of times. The project originally was directed at detecting sea mines and unexploded ordnance in shallow water and is sponsored jointly by the DOE and the Department of Defense (Sandia National Laboratories, [undated], Sandia Labs developing means to sniff out mines chemically and electronically, accessed June 15, 2001, at URL http://www.sandia.gov/explosive/projects/landmine.htm).

An instrument that can detect tiny explosions could lead to an inexpensive hand-held device to screen people and luggage at airports or to detect landmines. The device, being developed at the DOE's Oak Ridge National Laboratory, is based on miniature micromachined silicon cantilevers one-tenth the width of a human hair that can detect tiny forces caused by heat-induced nanoexplosions. The instrument, which has sensitivity in the parts-per-trillion range, works by absorbing TNT molecules given off by explosives. As the semiconductor material absorbs the TNT and is heated with power from a battery, the TNT molecules undergo tiny explosions that are detected by an optical beam. In addition, by scanning an appropriate temperature range, researchers can use this technology to detect many explosive molecules, including those used in plastic explosives (Oak Ridge National Laboratory, February 21, 2000, ORNL technology detects explosives with mini-explosions, accessed June 15, 2001, at URL http://www.ornl.gov/Press_Releases/archive/mr20000221-00.html).

Outlook

The DOE projects a 4.5% increase in coal production in 2001 and a 1.4% increase in production in 2002. Almost all of the production increase is projected to come from the western region. A decrease in production is projected to occur in the interior region, and a small increase in production is projected in the Appalachian region for 2001 and 2002 (U.S. Energy Information Administration, May 2001, Short-term energy outlook, accessed June 20, 2001, at URL http://www.eia.doe.gov/pub/forecasting/steo/oldsteos/may01.pdf). If these projections are correct, explosives consumption should increase in 2001 and then remain about the same in 2002. Because most of the increase in coal production is forecast for the western region, explosives consumption is not expected to increase at the same pace as coal production; 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.

In the construction and quarrying sectors, a gradual increase in demand for construction aggregates is anticipated 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 21st Century.

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

(Metric tons)

Class	1999	2000
Permissibles	1,800	1,530
Other high explosives	31,100	33,900
Blasting agents and oxidizers	2,090,000	2,530,000
Total	2,120,000	2,570,000

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
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
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
2000:						
Permissibles	2	(3/)	(3/)	(3/)	--	2
Other high explosives	4	15	1	12	1	34
Blasting agents and oxidizers	1,720	332	235	182	70	2,530
Total	1,720	347	236	194	71	2,570

-- 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)

	Class							
	1999				2000			
	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	43	823	91,600	92,500	33	603	59,400	60,000
Alaska	--	32	3,770	3,800	--	50	12,100	12,200
Arizona	--	414	109,000	109,000	20	548	112,000	112,000
Arkansas	--	180	8,010	8,190	--	201	11,200	11,400
California	5	720	33,700	34,400	(2/)	522	41,600	42,100
Colorado	103	2,310	40,900	43,300	58	3,070	71,600	74,700
Connecticut	--	1,990	8,000	9,990	--	1,580	17,700	19,200
Delaware	--	2	96	98	--	--	81	81
Florida	--	224	8,740	8,970	--	235	16,800	17,000
Georgia	--	685	41,700	42,400	--	806	57,000	57,900
Hawaii	--	9	1,140	1,150	--	11	1,320	1,330
Idaho	21	462	7,590	8,070	11	535	12,800	13,400
Illinois	--	2,000	43,500	45,500	--	1,650	42,300	44,000
Indiana	1	381	33,900	34,200	9	546	37,900	38,400
Iowa	--	744	17,300	18,100	--	923	16,700	17,700
Kansas	--	303	16,900	17,200	--	440	18,900	19,300
Kentucky	975	2,460	408,000	411,000	806	2,720	499,000	502,000
Louisiana	--	136	2,040	2,180	--	131	2,000	2,130
Maine	--	146	517	663	--	20	270	290
Maryland 3/	(2/)	95	4,770	4,870	2	103	5,430	5,540
Massachusetts	--	403	2,390	2,790	--	418	3,450	3,870
Michigan	--	59	9,930	9,990	--	265	10,100	10,300
Minnesota	--	142	45,200	45,400	(2/)	204	63,700	63,900
Mississippi	--	407	6,640	7,050	--	22	1,400	1,420
Missouri	2	1,490	45,500	47,000	2	1,280	116,000	117,000
Montana	19	119	29,400	29,500	19	145	21,100	21,200
Nebraska	--	90	1,770	1,860	--	121	1,860	1,980
Nevada	4	1,300	124,000	125,000	4	1,710	75,300	77,000
New Hampshire	--	598	5,190	5,790	--	439	5,720	6,160
New Jersey	--	171	6,280	6,450	--	150	5,890	6,040
New Mexico	--	123	33,900	34,000	2	233	36,200	36,400
New York	3	605	11,800	12,400	1	825	13,500	14,400
North Carolina	--	1,320	44,800	46,100	--	1,560	52,500	54,100
North Dakota	--	6	1,860	1,860	--	9	601	610
Ohio	5	477	69,800	70,300	6	539	74,100	74,600
Oklahoma	1	202	20,300	20,500	1	249	17,900	18,100
Oregon	--	180	5,280	5,460	--	142	4,980	5,120
Pennsylvania	98	3,280	110,000	114,000	88	1,980	139,000	141,000
Rhode Island	--	17	80	96	--	20	568	589
South Carolina	--	126	9,070	9,200	--	174	11,200	11,300
South Dakota	--	33	3,370	3,400	--	12	1,010	1,020
Tennessee	3	730	45,500	46,300	3	1,460	48,600	50,100
Texas	(2/)	420	28,400	28,800	3	716	39,000	39,700
Utah	138	764	33,800	34,700	87	385	50,900	51,300
Vermont	6	39	518	562	8	35	238	281
Virginia	250	1,700	194,000	196,000	206	2,690	231,000	234,000
Washington	--	1,030	10,700	11,700	--	1,110	14,600	15,700
West Virginia	121	609	214,000	214,000	117	1,240	220,000	221,000
Wisconsin	--	320	11,000	11,300	--	503	15,400	15,900
Wyoming	4	233	81,400	81,700	44	635	223,000	224,000
Total	1,800	31,100	2,090,000	2,120,000	1,530	33,900	2,530,000	2,570,000

-- 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