



U.S. Department of the Interior • Bureau of Mines

MINERAL INDUSTRY SURVEYS

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Annual Review

EXPLOSIVES IN 1993

U.S. production of industrial explosives and blasting agents declined slightly in 1993, based on producer sales of 1.876 million metric tons, according to the U.S. Bureau of Mines. Increases in metal mining and construction activity were partially offset by a decrease in coal production, traditionally the largest market for explosives. Explosives sales were recorded in all 50 States.

Sales of ammonium nitrate-base explosives decreased slightly to 1.840 million tons and represented 98% of U.S. consumption of industrial explosives. High explosives sales fell by 13%, continuing a downward trend begun in 1988.

Coal mining was estimated to account for 66% of the total U.S. explosives demand in 1993. Quarrying and nonmetal mining accounted for 13% of demand; metal mining, 11%, construction, 7% and miscellaneous uses, 3%. Coal production in the United States fell by 5.4%, according to the U.S. Department of Energy. Both the Appalachian and Interior sections of the country showed sharp declines, while coal production in Western States increased by 5.1%. According to the Federal Reserve Board production indices, metal mining activity increased by about 4% and quarrying and nonmetal mining activity remained about the same. Based on the value of new construction, in constant 1987 dollars, reported by the Economics and Statistics Administration, Bureau of the Census, new construction in 1993 increased by 4% from the 1992 level.

Five States, Kentucky, West Virginia, Arizona, Wyoming, and Pennsylvania, in descending order, accounted for 43% of total explosives demand in 1993. Of these States, Wyoming, Kentucky, West Virginia, and Pennsylvania, in descending order, also ranked in the top five coal-producing States, together producing 59% of total U.S. coal production.

ICI Explosives Environmental Co. reportedly signed

a contract with the U.S. Army to convert the Indiana Army Ammunition Plant in Chestertown, IN, from a military base to a site for commercial manufacturing. The 1,400-building facility had operations for loading propellant charges and manufacturing charge bags, single-base smokeless propellant, and black powder. ICI Explosives also announced that it would complete a feasibility study to convert or demilitarize surplus Russian conventional ammunition for use as commercial explosives. The feasibility study was supported by a \$300,000 grant from the U.S. Trade and Development Agency. Russia claimed to have almost 2 million tons of conventional munitions that were designated as excess and were ready for conversion. ICI was expected to work with a Russian firm, Nitro-Vzryv, which manufactures military and commercial explosives to complete the study by the beginning of 1994.¹

The Mine Safety and Health Administration (MSHA) published a final rule on eight safety standards for explosives at metal and nonmetal mines. On January 18, 1991, MSHA published a final rule in the Federal Register that set safety measures to address explosive hazards that may be present when persons use or work near explosive materials at metal and nonmetal mines. Most of the regulations became effective on November 1, 1991; the remaining eight regulations were subject to an administrative stay. The final rule on the remaining regulations, effective on December 30, 1993, defined "barrier," "blast site," "magazine," and "storage facility;" addressed storage of blasting agents; location of explosive material storage facilities; vehicles transporting explosive material; primer protection; loading and blasting; double trunklines in nonelectric initiation systems; excessive temperatures; and burning explosive material.²

The International Society of Explosives Engineers

(SEE) held its annual conference on explosive and blasting technique from January 30 to February 4, 1994. Topics covered at the conference included blasting and productivity, vibration, blast design, blast analysis tools, environmental effects of blasting, and computer blast modeling. Published conference proceedings may be obtained from SEE. The SEE also held the 20th annual Kentucky Blasting Conference from December 1-3, 1994. Presentation subjects at the conference included regulations, community relations, and legal concerns as well as technical subjects.

The Energy Information Administration expected coal production to increase by 10.4% in 1994 as coal producers and consumers replenish stocks drawn down as a result of the United Mine Workers of America against member companies of the Bituminous Coal Operators' Association early in 1993. If coal production increases, demand for explosives also is expected to increase, but at a slower rate. Coal production has increased mainly in the Western States, which in general have lower overburden to matrix ratios and, consequently, higher production efficiencies.

Companies covered by this report, including IME members, are as follows:

- * Apache Nitrogen Products Inc. – Benson, AZ
- * Arcadian Corp. – Memphis, TN
- Austin Powder Co. – Cleveland, OH
- * Coastal Chem Inc. – Cheyenne, WY
- Amos L. Dolby Co. – Corsica, PA
- El Dorado Chemical Co. – St. Louis, MO
- * Dyno Nobel Inc. – Salt Lake City, UT¹
- The Ensign-Bickford Co. – Simsbury, CT
- Explosives Technologies International Inc. (ETI) –
Wilmington, DE
- GOEX International Inc. – Cleburne, TX
- ICI Explosives Canada – NY; Ontario, Canada
- ICI Explosives USA Inc. – Dallas, TX
- * LaRoche Industries Inc. – Atlanta, GA
- Mining Services International – Salt Lake City, UT
- * Mt. State Bit Service Inc. – Morgantown, WV
- * Nitram Inc. – Tampa, FL
- Nitrochem Inc. – Montreal, Quebec, Canada
- SENEX Explosives Inc. – Cuddy, PA²
- Sierra Chemical Co. – Reno, NV
- Slurry Explosive Corp. – Oklahoma City, OK
- Trojan Corp. – Salt Lake City, UT
- * Unocal Corp. – Los Angeles, CA
- Viking Explosives and Supply Co. – Rosemount,
MN

*Indicates non-IME members.

¹Formerly IRECO Inc.

²Formerly H. L. and A. G. Balsinger Inc.

Classification of Industrial Explosives and Blasting Agents—Apparent consumption of commercial explosives used for industrial purposes in this report is defined as sales reported to the Institute of Makers of Explosives (IME) by members and furnished to the U.S. Bureau of Mines on a proprietary basis, together with sales directly reported to the Bureau by nonmember manufacturers. Commercial explosives imported for industrial uses are included. Certain explosives sales may be concealed under "unprocessed ammonium nitrate" to avoid disclosure of individual company proprietary data.

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 are minor and were last reported by the Bureau in 1971.

The production classifications used in this report are the same as those adopted by IME.

High explosives:

Permissibles—Grades approved by brand name by the Mine Safety and Health Administration (MSHA), as established by U.S. Bureau of Mines testing.

Other high explosives—All high explosives except permissibles.

Blasting agents:

Ammonium nitrate-fuel oil (ANFO)—All mixtures, regardless of density

Bulk slurries, water gels, and emulsions—All bulk slurries, water gels, emulsions and ANFO mixtures containing slurries, water gels and emulsions.

Unprocessed ammonium nitrate—Includes prilled, grained, and water solution (liquor) ammonium nitrate sold for use in the manufacture of commercial explosives.

¹The Journal of Explosives Engineering. V. 11, No. 1, May-June 1993, p. 28.

²Federal Register. Safety Standards For Explosives at Metal and Nonmetal Mines. Final Rule. (Dep. Labor). V. 58, No. 249, Dec. 30, 1993, pp. 69596-69617.

TABLE 1
SALIENT STATISTICS OF INDUSTRIAL EXPLOSIVES AND BLASTING
AGENTS SOLD FOR CONSUMPTION IN THE UNITED STATES, 1992-93

(Metric tons)

Class	1992	1993
Permissibles	4,970	4,429
Other high explosives	37,294	32,259
Water gels, slurries, and emulsions	285,136	277,219
Ammonium nitrate-fuel oil blasting agents	254,168	262,335
Unprocessed ammonium nitrate	1,311,519	1,300,022
Total	1,893,087	1,876,264
Total (thousand pounds) ¹	4,173,538	4,136,449

¹One metric ton is equal to 2,204.62 pounds.

TABLE 2
INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS SOLD FOR CONSUMPTION IN
THE UNITED STATES, BY CLASS AND USE, 1992-93^{e 1}

(Thousand metric tons)

Class	Coal mining		Quarrying and nonmetal mining		Metal mining		Construction work		All other purposes		Total ²	
	1992	1993	1992	1993	1992	1993	1992	1993	1992	1993	1992	1993
Permissibles	4.9	4.4	(³)	(³)	--	--	(³)	(³)	--	--	5.0	4.4
Other high explosives	5.0	4.3	16.8	14.1	1.8	1.6	12.2	10.4	1.5	1.9	37.3	32.3
Water gels and slurries	103.9	96.2	98.4	96.9	41.3	40.2	37.2	39.7	4.4	4.2	285.1	277.2
Ammonium nitrate-fuel oil blasting agents	150.6	153.6	50.8	52.4	18.6	19.2	30.8	34.9	3.3	2.2	254.1	262.3
Unprocessed ammonium nitrate	1,010.2	980.4	78.9	79.2	137.9	147.6	46.7	50.8	37.8	42.0	1,311.5	1,300.0
Total	1,274.6	1,238.9	244.9	242.6	199.6	208.6	126.9	135.8	47.0	50.3	1,893.0	1,876.2
Total (million pounds) ⁴	2,810.0	2,731.3	540.1	534.8	440.0	459.9	280.0	299.4	103.4	110.9	4,173.5	4,136.4

^eEstimated. ^rRevised.

¹Distribution of industrial explosives and blasting agents by consuming industry in 1992 and 1993 estimated from indices of industrial production and economies as reported by the Department of Energy, Federal Reserve Board, Department of Transportation, and Bureau of the Census.

²Data may not add to totals shown because of independent rounding.

³Less than 1/2 unit.

⁴One metric ton is equal to 2,204.62 pounds.

TABLE 3
INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS SOLD FOR CONSUMPTION
IN THE UNITED STATES, BY STATES AND CLASS, 1993

(Metric tons)

State	Class						Total
	Fixed high explosives			Blasting agents			
	Permissible	Other high explosives	Water gels, slurries, and emulsions	Ammonium nitrate-fuel oil blasting agents	Unprocessed ammonium nitrate		
Alabama	90	518	2,008	4,147	83,890	70,449	
Alaska	18	1,163	1,258	871	3,484	8,822	
Arizona	--	741	18,182	834	115,074	132,811	
Arkansas	39	548	2,007	4,050	1,301	7,945	
California	--	810	3,748	802	33,805	38,063	
Colorado	--	532	3,270	285	17,158	21,253	
Connecticut	--	384	1,354	722	3,408	6,868	
Delaware	--	--	--	--	2	2	
Florida	20	281	1,580	508	25,418	27,803	
Georgia	--	701	3,407	5,858	8,856	18,822	
Hawaii	--	--	6	22	80	88	
Idaho	--	357	384	501	7,607	8,849	
Illinois	38	1,181	15,802	14,805	8,623	41,229	
Indiana	11	709	13,573	34,072	30,633	78,888	
Iowa	--	2,007	2,790	754	4,775	10,328	
Kansas	--	642	853	3,827	5,467	10,589	
Kentucky	2,680	2,953	35,742	65,098	211,777	316,250	
Louisiana	--	202	44	637	13	1,096	
Maine	--	122	111	185	--	418	
Maryland ¹	3	82	235	538	1,181	2,039	
Massachusetts	--	586	1,109	1,190	372	3,257	
Michigan	68	91	7,818	3,849	22,206	33,832	
Minnesota	--	314	35,206	1,657	48,701	86,878	
Mississippi	--	108	1	81	--	190	
Missouri	15	3,008	6,982	11,423	14,071	35,497	
Montana	--	682	2,778	1,373	43,130	47,981	
Nebraska	--	78	110	58	3,581	3,827	
Nevada	18	730	15,782	8,017	68,620	91,187	
New Hampshire	--	401	890	874	--	2,165	
New Jersey	--	288	668	264	7	1,427	
New Mexico	--	571	4,130	300	84,747	89,748	
New York	--	580	1,354	1,944	7	3,885	
North Carolina	--	889	4,800	2,437	14,200	22,326	
North Dakota	--	14	222	2,558	225	3,019	
Ohio	22	931	8,420	10,558	77,252	95,183	
Oklahoma	1	337	2,715	4,908	2,478	10,439	
Oregon	--	476	120	1,729	3,171	5,496	
Pennsylvania	315	2,191	14,288	25,335	81,071	103,200	
Rhode Island	--	55	10	73	--	138	
South Carolina	--	81	1,492	883	--	2,438	
South Dakota	4	46	388	835	727	2,000	
Tennessee	24	1,256	6,547	4,330	13,337	25,494	
Texas	12	722	3,267	10,204	15,787	29,972	
Utah	44	270	1,916	69	14,834	16,933	
Vermont	--	61	39	95	--	195	
Virginia	722	1,065	11,100	8,855	77,899	99,641	
Washington	--	931	645	3,871	10,809	16,456	
West Virginia	261	828	28,210	14,089	97,884	141,272	
Wisconsin	2	664	2,383	607	6,102	9,758	
Wyoming	22	296	11,304	3,847	94,686	110,159	
Total ²	4,429	32,259	277,219	262,335	1,300,022	1,876,264	
Total (thousand pounds)	9,764	71,119	611,162	578,349	2,866,055	4,138,449	

¹Includes District of Columbia.

²Data may not add to totals shown because of independent rounding.

³One metric ton is equal to 2,204.62 pounds.

TABLE 4
SUPPLY TRENDS U.S. INDUSTRIAL EXPLOSIVES

(Thousand metric tons)

Calendar year	Ammonium nitrate	ANFO	Water gels and slurries	Other high explosives	Permissible	Total supply ¹
1980	1,017	633	183	80	25	1,939
1981	1,104	552	218	72	24	1,969
1982	1,079	471	149	54	21	1,774
1983	1,179	262	187	46	17	1,692
1984	1,415	288	213	46	18	1,976
1985	1,201	290	175	63	16	1,745
1986	1,219	294	191	60	16	1,779
1987	1,456	286	219	65	15	2,040
1988	1,375	394	298	68	13	2,148
1989	1,466	347	291	64	10	2,180
1990	1,482	310	294	61	9	2,156
1991	1,256	264	276	49	5	1,850
1992	1,312	254	285	37	5	1,893
1993	1,300	262	277	32	4	1,876

¹Data may not add to totals shown because of independent rounding.

Source: U.S. Bureau of Mines.

TABLE 5
DEMAND TRENDS U.S. INDUSTRIAL EXPLOSIVES

(Thousand metric tons)

Calendar year	Coal mining	Quarrying & nonmetal mining	Metal mining	Construction work	Other purposes	Total demand ¹
1980	1,147	287	259	191	57	1,939
1981	1,134	252	334	151	97	1,969
1982	1,119	215	242	122	76	1,774
1983	1,030	229	221	134	78	1,692
1984	1,307	231	205	138	95	1,976
1985	1,091	244	179	112	119	1,745
1986	1,164	266	145	117	87	1,779
1987	1,461	235	154	140	50	2,040
1988 ²	1,424	272	200	154	98	2,148
1989 ²	1,442	290	227	145	75	2,180
1990 ²	1,451	290	227	145	43	2,156
1991 ²	1,252	246	191	118	44	1,850
1992 ²	1,275	245	200	127	44	1,893
1993 ²	1,239	243	209	136	50	1,876

¹Revised.

¹Data may not add to totals shown because of independent rounding.

²Distribution of total demand, estimated.

Source: U.S. Bureau of Mines.

FIGURE 1
SUPPLY TREND FOR U.S. INDUSTRIAL EXPLOSIVES

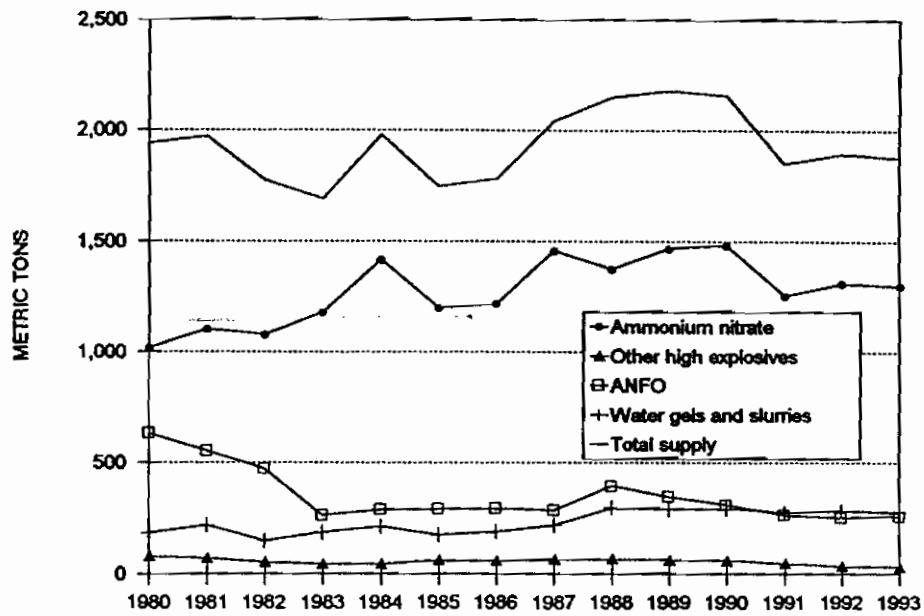


FIGURE 2
DEMAND TREND FOR U.S. INDUSTRIAL EXPLOSIVES

