



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

MINERAL INDUSTRY SURVEYS

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Explosives, Annual

APPARENT CONSUMPTION OF INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS IN THE UNITED STATES, 1992

U.S. apparent consumption of domestic and imported industrial explosives materials increased by a moderate 2.3% based on producer sales of 4.2 billion pounds, according to the U.S. Bureau of Mines. Domestic explosives demand continued to be limited by economic growth and mild weather conditions that combined to dampen fuel and nonfuel minerals output and construction activity. Explosives sales were recorded in 49 States in 1992, including Hawaii.

Ammonium nitrate-based explosives sales increased 3.1% to 4.1 billion pounds and accounted for about 98% of U.S. apparent domestic consumption of industrial explosives. Domestic production of industrial grade ammonium nitrate increased by 5% to 4.0 billion pounds in 1992, according to U.S. Bureau of the Census data.

High explosives sales continued to trend downward from the last cyclical peak established in 1988, and fell by a significant 22% in 1992, tracking a drop of 21% in 1991. *Other high explosives* sales declined 23%, to 82.2 million pounds, while *permissibles* dropped 13%, to 11.0 million pounds.

Coal mining typically accounts for about 65% to 68% of U.S. explosives demand, quarrying and nonmetal mining, 13% to 15%; metal mining, 10%; construction, 7%; and miscellaneous use, 2% to 4%. Coal output was up 0.4% in 1992, according to the U.S. Department of Energy, while Federal Reserve Board production indices reflected a 3% increase in metal mining and virtually no change in nonmetal mining. Construction activity was up 6%, according to the Economics and Statistics Administration, Bureau of the Census.

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Prepared by the Branch of Industrial Minerals and Branch of Data Collection and Coordination, August 23, 1993.

Events, Trends, and Issues

Industrial explosives demand continued to be negatively impacted by sluggish industrial productivity and mild winter weather that, in combination, restricted growth in nonfuel minerals mining across the United States and in coal output east of the Mississippi River. There was continued growth in openpit mining of low-sulfur western coal, however. Although U.S. coal output increased by only 0.4% to 1.0 billion short tons in 1992, Western States production increased 3.8% to a record 0.4 billion tons owing to higher production rates in New Mexico, North Dakota, Colorado, and Texas. Western coal mines, in general, have lower overburden to matrix ratios and higher production efficiencies.

Fifteen States accounted for more than 80% of U.S. industrial explosives demand in 1992, of which 13 States produced 85% of our Nation's coal. Nevada and Minnesota, non-coal-producing States, ranked fifth and twelfth in order of importance and accounted for about 8% of U.S. explosives consumption in 1992.

The 9-State Appalachian region of the eastern United States accounted for about 48% of U.S. explosives consumption. Kentucky, West Virginia, and Pennsylvania, in the Appalachian coal belt, continued to lead the nation with 34% of apparent domestic demand. The remaining 52% of U.S. explosives use was distributed among 15 Western States (28%); 10 interior States (16%); 11 States in the Northeast (7%); and 4 southern States (1%). Wyoming, the nation's leading coal producer, consumed 18% of Western States explosives, and accounted for 5% of total U.S. explosives demand.

In February, union and management labor negotiations broke down and more than 5,000 coal miners represented by the United Mine Workers of America (UMWA) and the Bituminous Coal Operators Association (BCOA) went out on strike. A total of 22 mines in Indiana, Illinois, Kentucky, and West Virginia were affected by the strike for 30 days through March 2, when union officials announced that collective bargaining would resume.

Explosives sales by consuming industries in 1991-92 were estimated as shown in table 2. Correlation patterns between explosives sales and end-use sectors were developed from Bureau of Mines time series data and leading indicators of industrial production and economics as reported by the Department of Energy, Federal Reserve Board, and the U.S. Department of Commerce, Bureau of the Census.

Industry Review

Coastal Chem, Inc. completed a 130,000-ton-per-year low-density ammonium nitrate plant at Elko, NV, that came on-stream in the fall of 1992. Unocal's plans for a new 150,000-ton-per-year explosives-grade ammonium nitrate plant at West Sacramento, CA, continued to be significantly delayed by economic and regulatory considerations. Unocal was operating a 240,000-ton-per-year ammonium nitrate facility at Kennewick, WA, purchased from Chevron in 1991.

ICI Canada, a subsidiary of ICI, United Kingdom, sold its Courtright, Ontario, nitrogen business to Terra International, Inc. of the United States during the first quarter of 1993. The Courtright plant can produce up to 450,000 tons per year of ammonia for fertilizer and industrial use, and 150,000 tons per year of high-density ammonium nitrate primarily for fertilizer use. Capacity was also in place for the production of urea and urea-ammonium nitrate solutions. The Courtright plant represents the last remaining ammonia nitrogen manufacturing facility in eastern Canada.

Effective January 1, 1993, ICI Explosives USA, Inc. of Dallas, TX, announced the consolidation of wholly owned ICI subsidiary distributors formerly operated under Atlas Powder Co. The consolidation and reorganization will allow the firm to focus all manufacturing, field technical, and research facilities on the priorities of its independent distributors and end-use customers. ICI Explosives USA, a member of ICI Explosives World Group, is a supplier of explosives and initiation systems to the construction, coal, and metal mining industries.

Several explosives manufacturers surveyed by the U.S. Bureau of Mines in 1992 advertised new products and accessories in various public information sources.

Explosives Research and Technology

A record 1,151 attendees from 37 countries gathered for the International Society of Explosives Engineers (S.E.E.) 19th Annual Conference on Explosives and Blasting Technique, and 9th Annual Research Symposium and Exhibits in San Diego, CA, January 31 to February 4, 1993. About 3,000 members in over 79 countries are served from S.E.E. headquarters in Cleveland, OH.

The Annual S.E.E. Conference has gained recognition in the explosives industry as the premier international forum targeted to assist the hands-on explosives user. The 1993 Program included exhibits, technical sessions, a research symposium, panel discussions, and workshops. Special workshops on *Insurance and the Explosives Industry and Safe Blasting Techniques* were featured. Also featured was the Blaster's Forum focusing on practical and unusual aspects of explosives work. Published conference proceedings may be obtained from S.E.E.

S.E.E.'s 20th Annual Conference on Explosives and Blasting Technique and 10th Annual Symposium on Explosives and Blasting Research will be held in Austin, TX, January 30 to

February 3, 1994. Detailed information may be obtained from S.E.E.

A broad range of blasting subjects was explored at the 19th Annual Kentucky Blasting Conference held in Lexington, KY, December 2 to 4, 1992. Underwater blasting, bridge demolition, laser profiling, and response of pressurized pipelines to mine blasting highlighted the diverse subjects presented at the conference. The Conference was also highlighted by a session on Department of Transportation Regulations HM 181. Over 40 exhibitors were on hand to display the latest in explosives products and services.

The Kentucky Blasting Conference represents the second largest annual gathering of the blasting community, eclipsed only by the annual S.E.E. Conference. The 20th Annual Kentucky Blasting Conference will be held December 1-3, 1993, in Lexington, KY. Details may be obtained by contacting the Kentucky Department of Mines and Minerals, P.O. Box 14080, Lexington, KY 40512; (606) 254-0367.

Outlook

Fuel and nonfuel minerals production, together with industrial construction activity, should collectively exhibit modest growth during 1993 with expectations for a return to more favorable growth patterns during 1994, dependent upon the level of domestic and global economic stimulus. In August 1993, the U.S. Department of Energy, Energy Information Administration (EIA) projected a 1% increase in coal output for the year based primarily on a return to normal weather conditions, attendant increases in electrical power consumption, and somewhat higher demand for coal at coke plants. Annualized domestic coal production volume through May, however, trailed 1991 volume by 5%; there was another strike of selected companies by the UMWA beginning in May, and exports continued to be restricted because of recessionary forces in Europe.

The long-range outlook for U.S. industrial explosives supply and demand should continue to be dependent upon the degree of return to economic growth, coupled with the ability of U.S. firms to effectively compete in the international minerals, chemicals, and materials marketplace. Environmental factors, evolutionary patterns in minerals and materials trends, competitive economics between fossil fuels in the U.S. energy equation, weather, and geopolitical factors, should continue to play an integral role in our Nation's productive capacity and industrial explosives demand potential.

Major factors that are projected to influence U.S. explosives demand during the next 20 years include: 1) a continuing trend of dominant growth in U.S. low sulfur coal output west of the Mississippi River to supply eastern powerplants in meeting the more stringent sulfur dioxide (SO₂) emissions control regulations of the Clean Air Act Amendments of 1990; 2) the added options of bringing powerplants into emissions compliance by shifts from the high-sulfur coal of northern Appalachia to the low-sulfur coal of central Appalachia; retrofitting with flue gas desulfurization (FGD) equipment; conversion to natural gas; purchasing SO₂ allowances from other utilities, or running at lower rates; 3) long-range prospects for significant growth in U.S.

coal exports from east of the Mississippi, to Western Europe; and 4) long-term growth potential of coal relative to natural gas and to oil, in particular.

One major offshoot of the Clean Air Act Amendments of 1990 has been the significant increase in limestone quarrying and downstream use for the removal of sulfur dioxide (SO₂) emanating from flue gas in electrical powerplants. This, in turn, may potentially result in a significant increase in explosives demand in the limestone industry.

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Explosives Engineering Journal. International Society of Explosives Engineers, 29100 Aurora Road, Cleveland, OH 44139, bimonthly, 1992 and 1993.

Mine Production Indices (1987 = 100). Board of Governors of the Federal Reserve System, July 1992.

Brady, B.T., G.J. Chekan, and C.V. Jude. Mining and Quarrying Trends in the Metals and Industrial Minerals Industries, Bureau of Mines. Annual Report -- 1991, June 1993, 55pp.

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

- * Apache Nitrogen Products, Inc.--Benson, AZ
- * Arcadian Corp.--Memphis, TN¹
 - Austin Powder Co.--Cleveland, OH
 - H. L. & A. G. Balsinger, Inc.--Cuddy, PA
- * Coastal Chem, Inc.--Cheyenne, WY
 - Amos L. Dolby Company, Corsica, PA
 - El Dorado Chemical Co.--St. Louis, MO
 - The Ensign-Bickford Co.--Simsbury, CT
 - Explosives Technologies International, Inc. (ETI)--
Wilmington, DE
- * Farmland Industries, Inc.--Kansas City, MO²
 - GOEX International, Inc.--Cleburne, TX
 - ICI Explosives Canada.--NY, Ontario, Canada³
 - ICI Explosives USA, Inc.--Dallas, TX⁴
 - IRECO Inc.--Salt Lake City, UT⁵
- * LaRoche Ind., Inc.--Atlanta, GA
 - Mining Services International--Salt Lake City, UT
- * Mt. State Bit Service, Inc.--Morgantown, WV⁶
- * Nitram, Inc.--Tampa, Florida
 - Nitrochem Inc.--Montreal, Quebec, Canada⁷
 - Sierra Chemical Co.--Reno, NV
- * Thermex Energy Corp.--Dallas, TX⁸
 - Trojan Corp.--Salt Lake City, UT
- * Unocal Corp.--Los Angeles, CA
 - Viking Explosives and Supply Co.--Rosemount, MN

*Indicates non-IME producers

¹Includes former Nitrex plant at Wilmington, NC; Columbia Nitrogen, at Augusta and Garden City, GA; and Hawkeye Chemical Co., Clinton, IA.

²Discontinued explosives sales in 1992.

³CIL prior to 1990.

⁴Owned by ICI of the United Kingdom; formerly Atlas Powder Co.

⁵Includes former Southeastern Energy, Inc. operation at Louisville, TN, purchased in 1990.

⁶Former IME distributor.

⁷Parent company of former Nitrochem Energy Corp., Allentown, PA.

⁸Firm discontinued operations in 1990.

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 reported directly 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. ANFO and "water gels and slurries" trends may be masked because of the large volume of unprocessed ammonium nitrate that had no identified end-use product description.

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 of Mines in 1971.

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

I. High Explosives

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

B. Other High Explosives: All high explosives except permissibles.

II. Blasting Agents

A. Ammonium Nitrate - Fuel Oil (ANFO): All mixtures regardless of density.

B. Bulk Slurries, Water Gels, and Emulsions: All bulk slurries, water gels, emulsions and ANFO mixtures containing slurries, water gels and emulsions.

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

TABLE 1
 SALIENT STATISTICS OF INDUSTRIAL EXPLOSIVES AND BLASTING
 AGENTS SOLD FOR CONSUMPTION IN THE UNITED STATES, 1991-1992
 (Thousand pounds)

Class	1991	1992
Permissibles-----	12,560	10,956
Other high explosives-----	107,339	82,220
Water gels, slurries, and emulsions-----	607,491	628,616
Ammonium nitrate-fuel oil blasting agents-----	581,506	560,344
Unprocessed ammonium nitrate-----	r/2,768,867	2,891,402
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Total-----	r/4,077,763	4,173,538
Total metric tons ¹ /-----	1,849,644	1,893,087

r/Revised.

¹/One 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, 1991-1992e/ 1/

(Million pounds)

Class	Coal mining		Quarrying and nonmetal mining		Metal mining		Construction work		All other purposes		Total ^{2/}	
	1991	1992	1991	1992	1991	1992	1991	1992	1991	1992	1991	1992
Permissibles-----	12.4	10.8	.1	.1	--	--	.1	.1	--	--	12.6	11.0
Other high explosives-----	14.0	11.0	48.0	37.0	6.0	4.0	35.0	27.0	4.3	3.2	107.3	82.2
Water gels and slurries-----	221.0	229.0	210.0	217.0	88.0	91.0	79.0	82.0	9.5	9.6	607.5	628.6
Ammonium nitrate- fuel oil blasting agents-----	345.0	332.0	116.0	112.0	43.0	41.0	70.0	68.0	7.5	7.3	581.5	560.3
Unprocessed ammonium nitrate-----	2,168.0	2,227.2	r/167.1	174.0	283.0	304.0	76.0	102.9	74.8	83.3	r/2,768.9	2,891.4
Total-----	2,760.4	2,810.0	r/ 541.2	540.1	420.0	440.0	260.1	280.0	96.1	103.4	r/4,077.8	4,173.5
Total thousand metric tons ^{3/}	1,252.1	1,274.6	245.5	225.0	191.5	199.6	118.0	127.0	43.6	46.9	1,849.7	1,893.1

e/Estimated. r/Revised.

1/Distribution of industrial explosives and blasting agents by consuming industry in 1990 and 1991 estimated from indices of industrial production and economics as reported by the Department of Energy, Federal Reserve Board, Department of Transportation, and Bureau of the Census.

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

3/One 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, 1992
(Thousand pounds)

State	Class					Total
	Fixed high explosives		Water gels, slurries, and emulsions	Blasting Agents		
	Permissibles	Other high explosives		Ammonium nitrate-fuel oil blasting agents	Unprocessed ammonium nitrate	
Alabama-----	315	791	4,728	14,389	117,511	137,734
Alaska-----	--	3,895	1,180	1,669	7,248	13,992
Arizona-----	--	1,820	1,285	216	213,733	217,054
Arkansas-----	1	1,823	4,959	11,841	3,452	22,076
California-----	12	1,987	7,637	4,701	78,965	93,302
Colorado-----	2	1,156	6,428	9	29,427	37,022
Connecticut-----	57	912	3,433	1,630	3,510	9,542
Florida-----	168	1,009	2,136	1,935	5,437	10,685
Georgia-----	--	1,346	5,097	10,377	16,368	33,188
Hawaii-----	--	--	43	167	223	433
Idaho-----	51	737	110	868	16,810	18,576
Illinois-----	38	3,451	53,865	50,904	51,339	159,597
Indiana-----	12	2,125	36,568	87,475	87,158	213,338
Iowa-----	--	3,913	5,978	2,073	15,171	27,135
Kansas-----	--	622	673	6,935	7,310	15,540
Kentucky-----	6,228	7,432	116,055	108,294	534,826	772,835
Louisiana-----	--	405	33	940	1,240	2,618
Maine-----	--	413	100	354	--	867
Maryland1/-----	5	401	321	994	2,932	4,653
Massachusetts-----	--	1,156	2,199	3,917	49	7,321
Michigan-----	141	844	13,227	12,220	39,544	65,976
Minnesota-----	--	688	23,745	6,683	97,450	128,566
Mississippi-----	--	344	--	167	751	1,262
Missouri-----	17	7,024	17,526	23,412	55,019	102,998
Montana-----	2	1,571	28,210	8,536	71,828	110,147
Nebraska-----	--	255	23	--	2,705	2,983
Nevada-----	93	2,277	24,816	5,404	182,518	215,108
New Hampshire-----	43	1,297	2,449	2,878	--	6,667
New Jersey-----	--	745	2,008	749	5,908	9,410
New Mexico-----	--	907	15,673	85	111,648	128,313
New York-----	--	1,681	5,239	2,919	25,706	35,545
North Carolina-----	2	2,475	5,473	4,709	1,361	14,020
North Dakota-----	--	--	--	--	30,643	30,643
Ohio-----	61	1,998	15,844	20,828	113,650	152,381
Oklahoma-----	7	1,353	4,876	23,851	40,444	70,531
Oregon-----	--	1,111	1,219	3,250	4,158	9,738
Pennsylvania-----	1,018	5,006	35,418	60,407	123,515	225,364
Rhode Island-----	--	165	84	366	--	615
South Carolina-----	--	75	2,314	2,060	2,811	7,260
South Dakota-----	--	245	1,631	388	7,463	9,727
Tennessee-----	98	3,305	12,304	10,184	26,253	52,144
Texas-----	11	3,760	6,137	21,652	33,227	64,787
Utah-----	102	806	848	--	44,106	45,862
Vermont-----	--	112	62	146	10,784	11,104
Virginia-----	1,371	2,609	10,544	8,357	172,346	195,227
Washington-----	--	2,020	670	2,068	22,623	27,381
West Virginia-----	1,074	2,124	93,725	27,356	299,500	423,779
Wisconsin-----	4	1,490	4,209	1,310	7,566	14,579
Wyoming-----	23	539	47,514	671	165,166	213,913
Total-----	10,956	82,220	628,616	560,344	2,891,402	4,173,538
Total metric tons2/-----	4,970	37,294	285,136	254,168	1,311,519	1,893,087

1/Includes District of Columbia.

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

TABLE 4
SUPPLY TRENDS U.S. INDUSTRIAL EXPLOSIVES
(Thousand short tons)

Calendar Year	Ammonium Nitrate	ANFO	Water Gels and Slurries	Other High Explosives	Permissibles	Total Supply ^{1/}
1980	1,121	698	202	88	28	2,137
1981	1,217	609	240	79	26	2,171
1982	1,189	520	164	59	23	1,955
1983	1,300	289	206	51	19	1,865
1984	1,555	318	235	51	20	2,178
1985	1,324	320	193	69	18	1,924
1986	1,344	324	210	66	18	1,961
1987	1,605	315	241	72	17	2,249
1988	1,516	434	329	75	14	2,368
1989	1,616	383	321	70	11	2,403
1990	1,634	342	324	67	10	2,377
1991	r/1,384	291	304	54	6	r/2,039
1992	1,446	280	314	41	5	2,087

r/Revised.

^{1/}Data 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 short tons)

Calendar Year	Coal Mining	Quarrying & Nonmetal Mining	Metal Mining	Construction Work	Other Purposes	Total Demand ^{1/}
1980	1,264	316	285	210	63	2,137
1981	1,250	278	368	166	107	2,171
1982	1,233	237	267	134	84	1,955
1983	1,135	252	244	148	86	1,865
1984	1,441	255	226	152	105	2,178
1985	1,203	269	197	124	131	1,924
1986	1,283	293	160	129	96	1,961
1987	1,610	259	170	154	55	2,249
1988 2/	1,570	300	220	170	108	2,368
1989 2/	1,590	320	250	160	83	2,403
1990 2/	1,600	320	250	160	47	2,377
1991 2/	1,380	r/271	210	130	48	r/2,039
1992 2/	1,405	270	220	140	52	2,087

r/Revised.

^{1/}Data may not add to totals shown because of independent rounding.

^{2/}Distribution of total demand, estimated.

Source: U.S. Bureau of Mines.

Fig. 1.-Supply trends U.S. industrial explosives

(Thousand short tons)

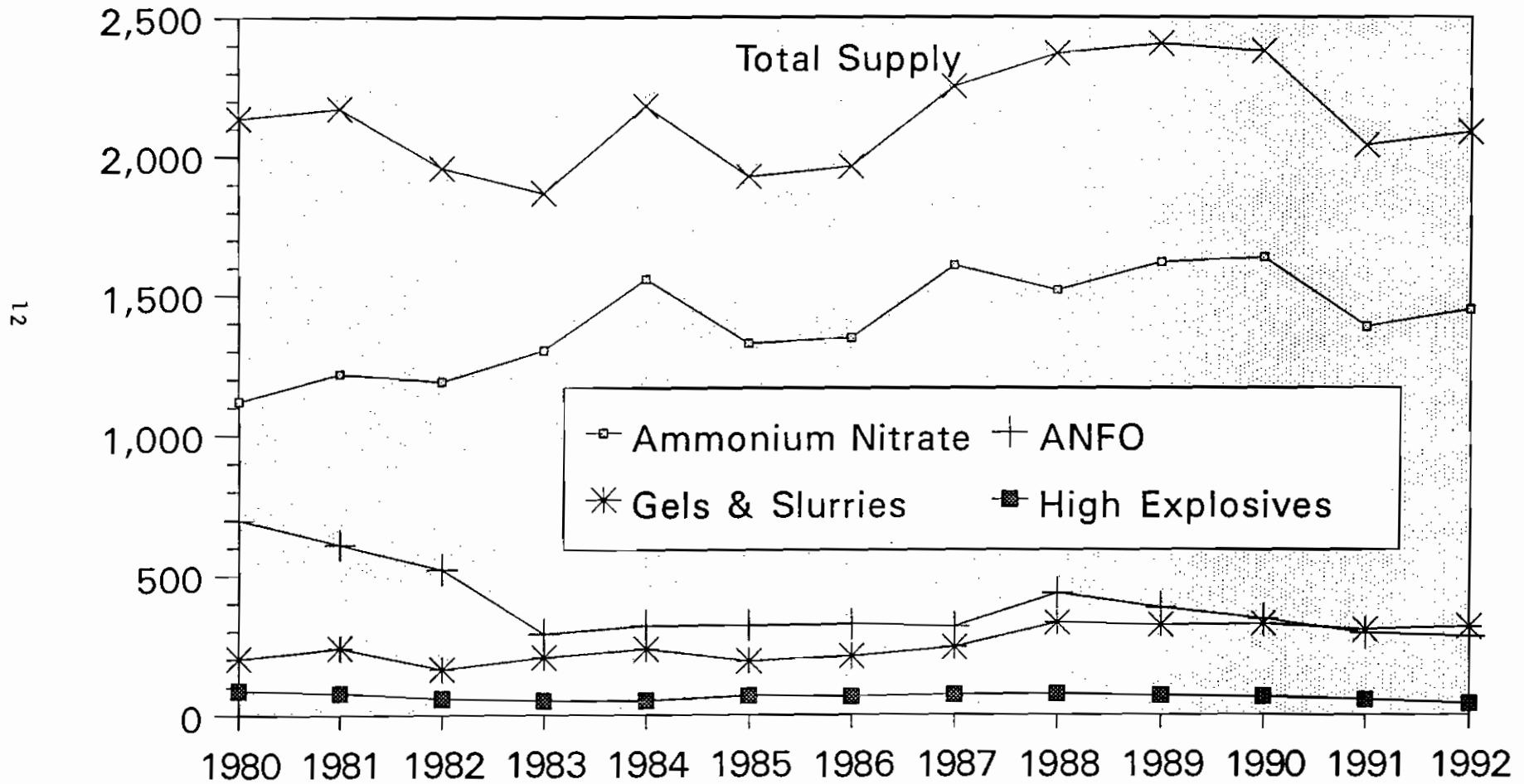


Fig. 2.-Demand trends U.S. industrial explosives

(Thousand short tons)

13.

