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, 1990

U.S. sales of industrial explosives and blasting agents were about 4.75 billion pounds in 1990, a slight decrease in apparent domestic consumption compared with 1989, according to the Bureau of Mines, U.S. Department of the Interior. Apparent domestic consumption is measured by U.S. producer sales of intermediate and processed industrial explosives, including imported materials. Explosives sales were recorded in 48 of the 50 States in 1990.

Sales of unprocessed ammonium nitrate, ammonium nitrate-fuel oil (ANFO) and "water gels and slurries" in 1990 were 4.60 billion pounds, or about 97% of total U.S. apparent explosives consumption. Unprocessed ammonium nitrate sales were 3.27 billion pounds, 69% of total; ANFO, 0.68 billion pounds, 14%; and "water gels and slurries," 0.65 billion pounds, 14%. 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.

In 1990, high explosives sales declined to 152.27 million pounds compared with 163.68 million pounds in 1989. Permissibles declined by a significant 15% and "other high explosives" fell 6%.

Ten States were collectively responsible for about 68% of all explosives and blasting agents consumed in the United States in 1990. Kentucky led the Nation with 18% of total, followed by West Virginia, 11%; Pennsylvania, Illinois, and Ohio, 6% each; Wyoming, 5%; and Arizona, Nevada, Alabama and Indiana, 4% each. Of the States listed, seven ranked in the top 10 in terms of U.S. coal production.

Coal mining has typically accounted for about 65% of U.S. explosives consumption, quarrying and nonmetal mining 15%, metal mining 10%, construction about 7%, and miscellaneous use, 3%-4%. According to available industrial indicators, coal output, metal mining, and nonmetal mining all increased by about 5% in 1990, while construction activity declined about 2%.

Prepared by the Branch of Industrial Minerals and Branch of Data Collection and Coordination, August 9, 1991.

Explosives sales by consuming industries in 1989-90 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, Department of Transportation and Bureau of the Census.1/

Ammonium Nitrate Project Review

El Dorado Chemical Co. doubled ammonium nitrate capacity to 560,000-tons-per-year at El Dorado, AK, in 1990, after moving a nitric acid plant from Hannibal, MO which it had acquired from American Cyanamid. LaRoche Industries, Inc. expanded ammonium nitrate capacity at Cherokee, AL, by about 50% to 220,000-tons-per-year based on the reconstruction of the former Chevron Ft. Madison, IA, nitric acid facility, onsite. Farmland Industries, Inc. started up a 60,000-ton-per-year ammonium nitrate plant at Enid, OK, that was formerly owned and operated by Chevron at Finley, WA.

Unocal Corp. was building a new 150,000-ton-per-year nitric acid facility at West Sacramento, CA, that would raise capacity about 70% to 240,000 annual tons. The firm planned to close its obsolete 120,000 annual ton ammonium nitrate facility at Brea, CA, commensurate with the start-up of the new Sacramento plant. Coastal Chem, Inc. planned to start-up a new 130,000-ton-per-year ammonium nitrate plant at Elko, WY, in 1992 that would be based on a used nitric acid plant to be reconstructed on the site.

Events, Trends, and Issues

Ireco Inc. purchased Southeastern Energy, Inc of Louisville, TN, in 1990. Canadian Industries Limited (CIL) Inc. adopted the name ICI Explosives Canada, to reflect primary corporate affiliation.

The Society of Explosives Engineers 17th Annual Conference of Explosives and Blasting Technique, and 7th Annual Research Symposium and Exhibits was held February 3-7, 1991 in Las Vegas, NV. The General Session of the Conference featured papers on many interesting subjects, including: Soviet Blasting Practices; Innovative and Change in Quarry Blasting; Mine Blasting Accident Update; Mining Taconite at an Old Mine; Performance in Quarry Blasts; Case Study - The Use of Heavy ANFO in Water Holes; and, Reducing Coal Damage in Western Pennsylvania.

The Research Symposium included papers on: Toxic Fumes From Shock-Damaged Permissible Explosives; Correlation of Shot Design Parameters to Fragmentation Blasting Research to Enhance Permeability for In Situ Mining; and, Advanced Primer Design.

1/ The publication of explosives demand by consuming industries on a State-by-State basis was discontinued in 1988 because of a significant decline in the responses of those canvassed.

Outlook

Industrial explosives demand was projected to decrease significantly in 1991 because of a general downturn in the economy and mining, coupled with a mild winter that weakened coal demand. The outlook for explosives demand long-range, however, looked promising, especially in the area of coal mining. Coal production in the United States is projected to increase by 45% over the next 20 years, driven by increases in demand for electricity generation and exports, according to the U.S. Department of Energy, Energy Information Administration (EIA).2/

According to EIA, U.S. coal production, which broke the 1-billion-ton mark in 1990, is expected to reach 1.5 billion short tons by the year 2010.

The electric power industry is expected to increase its share of total U.S. coal consumption from 86% in 1990 to 90% by 2010 and EIA expects no exodus from coal by electricity producers because of the Clean Air Act Amendments of 1990 over the next 20 years.

The EIA projects that U.S. coal exports will increase by 4.4% annually between 1990 and 2010. U.S. producers are expected to make significant inroads into Western Europe's steam coal needs, especially with the mandated decline in governmental subsidies to domestic coal producers by Germany and the United Kingdom. In addition, projected electricity growth in the developing countries of Asia is expected to provide markets for the U.S. coal industry, although competition with Australian coal exporters will continue to be intense.

2/ Energy Information Administration. Annual Outlook for U.S. Coal 1991. DOE/EIA-0333 (91), July, 1991, 51pp.

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

Apache Powder Co.--Benson, Arizona
* Arcadian Corp.--Memphis, Tennessee 1/
Atlas Powder Co.--Dallas, Texas 2/
Austin Powder Co.--Cleveland, Ohio
H. L. & A. G. Balsinger, Inc.--Cuddy, Pennsylvania
* Coastal Chem Inc.--Cheyenne, Wyoming
Amos L. Dolby Company, Corsica, Pennsylvania
El Dorado Chemical Co.--St. Louis, Missouri
Ensign Bickford Co.--Simsbury, Connecticut
Explosives Technologies International, Inc. (ETI)--Wilmington, Delaware
* Farmland Industries, Inc.--Kansas City, Missouri
Goex International, Inc.--Cleburne, Texas 3/
ICI Explosives Canada.--North York, Ontario, Canada 4/
Ireco Inc.--Salt Lake City, Utah
* LaRoche Ind., Inc.--Atlanta, Georgia
Mining Services International--Salt Lake City, Utah
Mt. State Bit Service, Inc.--Morgantown, West Virginia
Nitrochem Energy Corp.--Allentown, Pennsylvania 5/
Sierra Chemical Co.--Reno, Nevada
Southeastern Energy, Inc.--Louisville, Tennessee 6/
* Thermex Energy Corp.--Dallas, Texas
Trojan Corp.--Salt Lake City, Utah
* Unocal Corp.--Los Angeles, California
Viking Explosives and Supply Co.--Rosemount, Minnesota 7/

*Indicates non-IME members
1/ Includes former Nitrex plant at Memphis, TN, Columbia Nitrogen at Augusta, GA, and Garden City, GA, and Hawkeye Chemical Co., Clinton, IA.
2/ Owned by ICI of the United Kingdom.
3/ Former Goex Inc. operation restructured during 1990.
4/ Formerly CIL; in 1990, name was changed to reflect corporate ownership.
5/ Plant scheduled to close in 1991.
6/ Purchased by Ireco in 1990.
7/ Joined IME during 1990.

Ms. Jessie G. Austin (retired) of the Division of Statistics and Information Services (DSIS), monitored the Bureau of Mines annual explosives survey and assisted in the preparation of data for this report. Graphics were prepared by Mr. Joseph C. Daniels of DSIS.

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 Bureau of Mines on a proprietary basis, together with sales reported directly to the Bureau of Mines 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 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, 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, 1989-90
(Thousand pounds)

Class	1989	1990
Permissibles	22,784	19,481
Other high explosives	140,896	132,793
Water gels, slurries, and emulsions	642,042	648,428
Ammonium nitrate-fuel oil blasting agents	766,956	684,577
Unprocessed ammmonium nitrate	3,232,573	3,268,453
Total	4,805,251	4,753,732

TABLE 2.--Industrial explosives and blasting agents sold for consumption in the United States, by class and use, 1989-901/

(Thousand pounds)

Class	Coal mining		Quarrying and nonmetal mining		Metal mining		Construction work		All other purposes		Total2/	
	1989e/	1990e/	1989e/	1990e/	1989e/	1990e/	1989e/	1990e/	1989e/	1990e/	1989	1990
Permissibles	22,000	19,000	210	180	--	--	170	150	--	--	22,784	19,481
Other high explosives	19,000	18,000	61,000	57,000	9,000	8,000	42,000	40,000	9,000	9,000	140,896	132,793
Water gels and slurries	234,000	236,000	215,000	217,000	98,000	99,000	78,000	79,000	20,000	18,000	642,042	648,428
Ammonium nitrate-fuel oil blasting agents	456,000	407,000	159,000	142,000	53,000	47,000	80,000	71,000	18,000	18,000	766,956	684,577
Unprocessed ammonium nitrate	2,444,000	2,524,000	195,000	204,000	320,000	306,000	130,000	110,000	143,000	125,000	3,232,573	3,268,453
Total	3,175,000	3,204,000	630,210	620,180	480,000	460,000	330,170	300,150	190,000	170,000	4,805,251	4,753,732

e/Estimated.

1/Distribution of industrial explosives and blasting agents by consuming industry in 1989 and 1990 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. Industrial Production, tables 1A, 2A, and 4A, Federal Reserve Board.

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

TABLE 3.--Industrial explosives and blasting agents sold for consumption in the United States, by State and class, 1990
(Thousand pounds)

State	Class					
	Fixed high explosives			Blasting Agents		
	Permissibles	Other high explosives	Water gels, slurries, and emulsions	Ammonium nitrate-fuel oil blasting agents	Unprocessed ammonium nitrate	Total
Alabama	268	1,425	7,741	12,640	158,714	180,788
Alaska	87	5,896	1,956	2,478	2,744	13,161
Arizona	--	1,910	16,539	13,264	174,300	206,013
Arkansas	--	1,919	3,656	11,232	3,785	20,592
California	--	2,153	8,004	16,468	72,129	98,754
Colorado	246	2,280	5,276	4,855	44,789	57,446
Conneticut	--	2,427	2,242	2,854	4,692	12,215
Delaware	--	--	--	--	--	--
District of Columbia1/	--	--	--	--	--	--
Florida	--	1,482	26,518	878	2,777	31,655
Georgia	1	3,994	8,834	10,042	12,989	35,860
Hawaii	--	348	99	81	877	1,405
Idaho	--	2,588	821	3,476	34,875	41,760
Illinois	59	4,962	47,170	65,669	61,433	179,293
Indiana	20	2,849	45,113	122,883	117,381	288,246
Iowa	--	3,070	4,220	2,906	14,451	24,647
Kansas	215	1,055	1,259	10,534	40	13,103
Kentucky	11,273	8,763	108,378	76,294	643,314	848,022
Louisiana	--	193	75	5	--	273
Maine	--	424	459	538	--	1,421
Maryland	2	1,710	2,720	1,065	5,069	10,566
Massachusettes	--	2,301	2,841	2,831	257	8,230
Michigan	14	2,340	15,982	17,503	30,699	66,538
Minnesota	1	2,506	42,755	14,824	90,537	150,623
Mississippi	--	853	1	184	--	1,038
Missouri	4	9,773	11,063	43,179	75,688	139,707
Montana	4	2,096	26,521	13,362	127,273	169,256
Nebraska	--	284	--	684	2,600	3,568
Nevada	--	2,438	28,662	21,796	142,241	195,137
New Hampshire	--	1,178	1,060	1,999	--	4,237
New Jersey	1	1,652	4,390	1,583	2,425	10,051
New Mexico	1	1,228	580	1,010	129,208	132,027
New York	2	3,408	5,784	5,433	4,640	19,267
North Carolina	1	4,978	8,648	5,697	42,938	62,262
North Dakota	--	--	--	--	--	--
Ohio	47	2,597	23,994	36,044	209,252	271,934
Oklahoma	--	1,571	4,089	12,311	5,022	22,993
Oregon	--	1,660	429	5,362	13,247	20,698
Pennsylvania	587	10,007	45,608	41,317	202,732	300,251
Rhode Island	--	297	200	650	--	1,147
South Carolina	--	815	1,241	2,622	--	4,678
South Dakota	--	93	1,288	65	8,602	10,048
Tennessee	277	5,926	11,294	14,452	32,335	64,284
Texas	30	4,806	4,026	5,588	56,505	70,955
Utah	223	2,230	1,079	--	28,929	32,461
Vermont	--	262	301	130	--	693
Virginia	2,908	4,623	15,742	12,974	87,400	123,647
Washington	--	5,258	2,730	25,955	28,362	62,305
West Virginia	3,193	2,969	53,519	27,376	417,577	504,634
Wisconsin	--	1,443	3,676	2,089	3,084	10,292
Wyoming	17	3,753	39,845	9,395	172,541	225,551
Total	19,481	132,793	648,428	684,577	3,268,453	4,753,732

1/Included with Maryland.

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 Supply1/
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	66	10	2,377

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

Source: Branch of Industrial Minerals, 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 Demand1/
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
19882/	1,568	298	220	160	122	2,368
19892/	1,588	315	240	165	95	2,403
19902/	1,602	310	230	150	85	2,377

1/Data may not add to totals shown because of independent rounding.
2/Distribution of total demand, estimated.

Source: Branch of Industrial Minerals, Bureau of Mines.

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

(Thousand short tons)

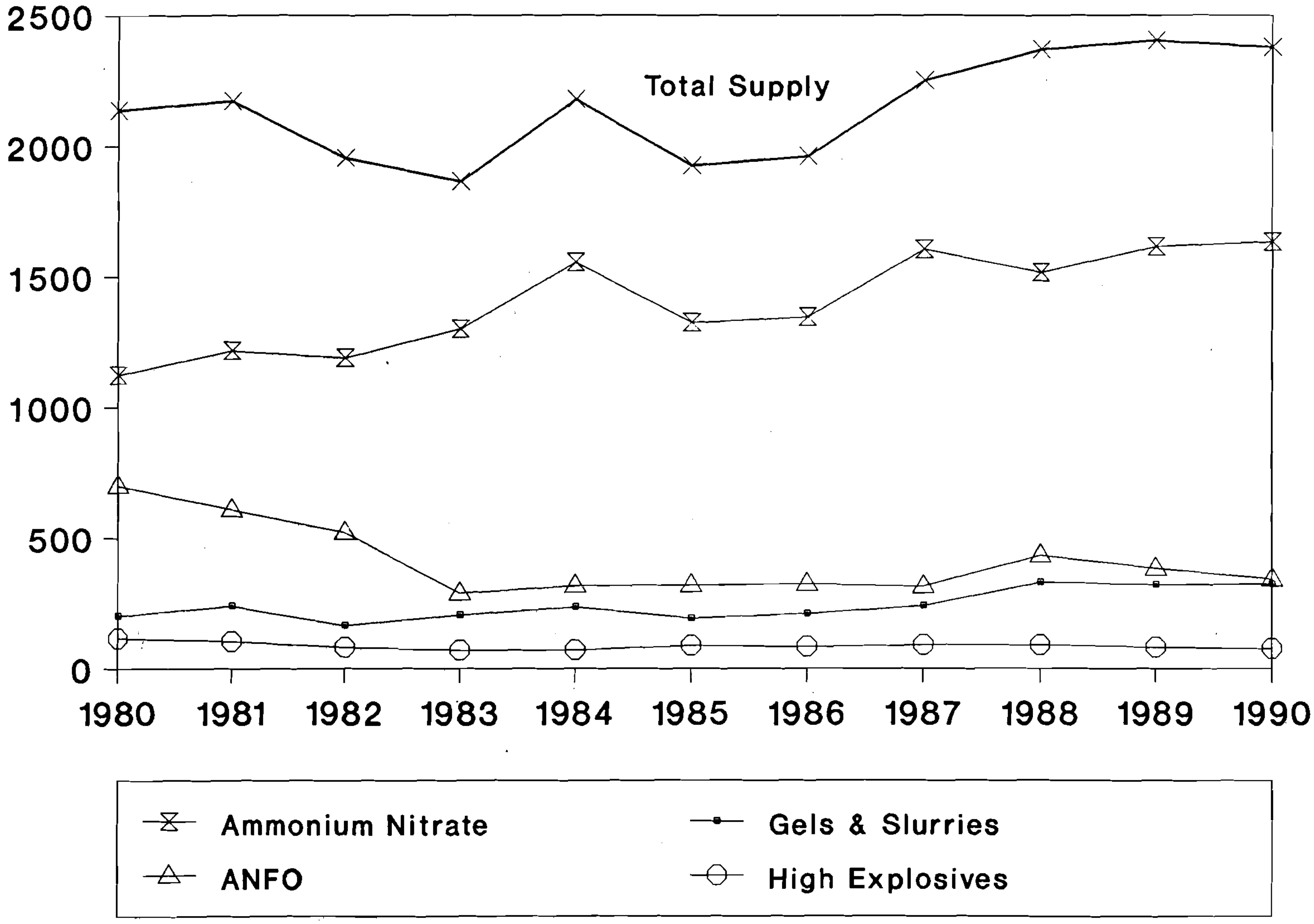

Fig 2.-Demand trends U.S. industrial explosives

(Thousand short tons)