



**U.S. Bureau of Mines**



# **MINERAL INDUSTRY SURVEYS**

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Explosives, Annual

## **APPARENT CONSUMPTION OF INDUSTRIAL EXPLOSIVES AND BLASTING AGENTS IN THE UNITED STATES, 1988**

Apparent consumption of explosives and blasting agents in the United States during 1988 approximated 4.7 billion pounds, representing an annual growth of 4%, according to the Bureau of Mines, U.S. Department of the Interior. Apparent consumption is defined as reported manufacturer sales.

Sales of unprocessed ammonium nitrate, ammonium nitrate-fuel oil (ANFO) and "water gels and slurries" totaled 4.5 billion pounds in 1988, accounting for 96% of apparent U.S. explosives demand. Sales of ANFO and "water gels and slurries" increased 38% and 37% respectively, while unprocessed ammonium nitrate declined 7%. Apparent demand for "other high explosives" improved 5% over the prior year while permissibles were down by a significant 18%.

According to mining and industrial activity data provided by Bureau of Mines sources, coal mining output increased 4% during 1988, metal mining 20%, nonmetal mining 9%, and construction work 4%. Coal mining typically accounts for about 65% of explosives consumption in the United States, quarrying and nonmetal mining 15%, and metal mining 10%. Construction work accounts for another 6%-7%, and miscellaneous use 3%-4%.

Explosives sales by consuming industries in 1988 were estimated and shown in Table 2. Correlation patterns between explosives sales and end uses for 1988 were developed from Bureau of Mines time series data and leading indicators of industrial production reported by the Department of Energy, Federal Reserve Board, and the Department of Transportation.<sup>1/</sup>

Seven States were collectively responsible for 55% of all explosives and blasting agents consumed in the United States in 1988. These were, in decreasing order of consumption: Kentucky, West Virginia, Pennsylvania, Wyoming, Indiana, Ohio, and Alabama.

<sup>1/</sup>Beginning with this report, the Bureau of Mines will discontinue reporting explosives demand by consuming industries on a State-by-State basis because of a significant decline in the responses of those canvassed.

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Prepared in the Branch of Industrial Minerals, August 22, 1989.

## Classification of Industrial Explosives and Blasting Agents

"Apparent consumption" of explosives and blasting agents 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, and sales by nonmember manufacturers reported directly to the Bureau. Classification of explosives and blasting agents by type and use were reported by the manufacturers. Sales of explosives and blasting agents imported by nonmanufacturers are not included. It is necessary to publish some data in a format to avoid disclosing proprietary data.

The principal distinction between explosives and blasting agents is their sensitivity to initiation. Explosives are cap-sensitive but blasting agents are not, and therefore require a primer. Only "high" explosives are currently reported in this Mineral Industry Surveys. "Low" explosives such as black powder and propellants burn very rapidly but do not detonate. Black powder has not been reported in industrial applications since 1971. Both explosives and blasting agents vary widely in composition, although most blasting agents are essentially mixtures of ammonium nitrate plus a fuel.

Water gels and slurries may be either explosives or blasting agents, but for convenience are classified in a separate category.

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

1. Permissibles.--Grades of high explosives approved by brand name by the Mine Safety and Health Administration or the U.S. Bureau of Mines for use, in a prescribed manner, in underground coal mines, including water gels and slurries.

2. Other High Explosives.--All high explosives except

(a) permissibles and

(b) any water gels or slurries that would otherwise be classified as high explosives.

Included in the "Other High Explosives" classification are all formulations packaged in metal containers.

3. Packaged and Bulk Water Gels, Slurries, and Emulsions.--All water gels, slurries, and emulsions, packaged or in bulk, made by addition of more than 5% water to high explosives or blasting agents, except those approved as permissibles.

4. Ammonium Nitrate-Fuel Oil Blasting Agents.--Without regard to packaging or container, and having a density less than 1.0 gram per cubic centimeter(cc).

5. Unprocessed Ammonium Nitrate.--Prilled or grained ammonium nitrate for use in blasting agents.

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

- \* American Cyanamid Co.--New Castle, Pennsylvania
- Apache Powder Co.--Benson, Arizona
- Atlas Powder Co.--Dallas, Texas
- Austin Powder Co.--Cleveland, Ohio
- H. L. & A. G. Balsinger, Inc.--Cuddy, Pennsylvania
- C-I-L Inc.--North York, Ontario, Canada
- \* Columbia Nitrogen Corp.--Augusta, Georgia/Garden City, Georgia
- El Dorado Chemical Co.--St. Louis, Missouri
- Ensign Bickford Co.--Simsbury, Connecticut
- Explosives Technologies International, Inc. (ETI)--Wilmington, Delaware<sup>1/</sup>
- Goex Inc.--Cleburne, Texas
- \* Hawkeye Chemical Co.--Clinton, Iowa
- Ireco Inc.--Salt Lake City, Utah<sup>2/</sup>
- \* LaRoche Ind., Inc.--Atlanta, Georgia
- Mining Services International--Salt Lake City, Utah
- Mt. State Bit Service, Inc.--Morgantown, West Virginia
- \* Nitrex--Memphis, Tennessee
- Nitrochem Energy Corp.--Allentown, Pennsylvania
- Sierra Chemical Co.--Reno, Nevada
- Southern Explosives Corp.--Glasgow, Kentucky<sup>3/</sup>
- Southeastern Energy, Inc.--Louisville, Tennessee
- \* Thermex Energy Corp.--Dallas, Texas
- Trojan Corp.--Salt Lake City, Utah
- \* Unocal Corp.--Los Angeles, California
- \* Wycon Chemical Co.--Cheyenne, Wyoming

\* Indicates non-IME members.

<sup>1/</sup> Acquired from E. I. du Pont during 1988. Formed Canadian subsidiary, with primary production facility located at North Bay, Ontario, Canada.

<sup>2/</sup> Independent Explosives Company of Pennsylvania, Scranton, PA., became wholly-owned subsidiary of Ireco during 1988.

<sup>3/</sup> Wholly-owned by ETI, effective 1988.

Table 1.--Salient statistics of industrial explosives and blasting agents sold for consumption in the United States, 1987-88

(Thousand pounds)

Class	1987	1988
Permissibles-----	33,853	27,670
Other high explosives-----	143,247	150,769
Water gels, slurries, and emulsions-----	481,358	658,273
Ammonium nitrate-fuel oil blasting agents-----	629,915	867,393
Unprocessed ammonium nitrate-----	3,209,884	2,973,801
<b>Total-----</b>	<b>4,498,257</b>	<b>4,677,906</b>

Table 2.--Industrial explosives and blasting agents sold for consumption in the United States, by class and use, 1987-881/

(Thousand pounds)

Class	Coal mining		Metal mining		Quarrying and nonmetal mining <sup>2/</sup>		Construction work		All other purposes <sup>3/</sup>		Total <sup>4/</sup>	
	1987	1988e/	1987	1988e/	1987	1988e/	1987	1988e/	1987	1988e/	1987	1988
Permissibles-----	33,391	27,000	--	--	248	250	214	200	--	--	33,853	27,670
Other high explosives-----	23,171	20,000	9,013	10,000	62,250	65,000	43,355	45,000	5,458	10,000	143,247	150,769
Water gels and slurries-----	195,737	240,000	63,125	100,000	160,412	220,000	55,758	80,000	6,326	20,000	481,358	658,273
Ammonium nitrate-fuel oil blasting agents-----	399,728	515,000	29,269	60,000	134,337	180,000	63,860	90,000	2,721	20,000	629,915	867,393
Unprocessed ammonium nitrate-----	2,568,735	2,335,000	238,876	270,000	125,664	125,000	145,725	105,000	130,884	140,000	3,209,884	2,973,801
Total-----	3,220,762	3,137,000	340,283	440,000	482,911	590,250	308,912	320,200	145,389	190,000	4,498,257	4,677,906

e/Estimated.

1/Distribution of industrial explosives and blasting agents by consuming industry in 1988, estimated from indices of industrial production as reported in Statistical Release G.12.3, Industrial Production, tables 1A, 2A, and 4A, Federal Reserve Board, April 14, 1989.

2/Some quantities of this use for 1987 are included with "All other purposes" to avoid disclosing company proprietary data.

3/Includes some quantities from quarrying and nonmetal mining for 1987.

4/Data for 1988 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, 1988

(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	575	1,886	8,844	9,591	197,314	218,210
Alaska	1	6,420	1,761	5,360	--	13,542
Arizona	--	1,998	17,448	8,584	113,190	141,220
Arkansas	--	931	4,343	5,043	934	11,251
California	2	2,745	9,927	9,930	70,694	93,298
Colorado	23	2,570	7,215	16,179	85,636	111,623
Connecticut	3	4,262	3,303	5,747	1,458	14,773
Delaware	--	13	1	10	1,774	1,798
District of Columbia <sup>1</sup>	--	--	--	--	--	--
Florida	--	2,383	41,260	1,244	1,117	46,004
Georgia	--	2,980	13,160	9,914	12,297	38,351
Hawaii	--	119	123	135	--	377
Idaho	--	1,548	230	1,655	31,604	35,037
Illinois	23	3,558	52,845	43,265	42,460	142,151
Indiana	6	2,712	59,996	87,752	111,977	262,443
Iowa	28	4,122	3,479	3,613	14,449	25,691
Kansas	--	1,158	1,948	12,002	37,776	52,884
Kentucky	16,855	8,989	93,389	210,408	448,121	777,762
Louisiana	--	539	46	6	--	591
Maine	--	1,527	845	1,216	--	3,588
Maryland	4	1,321	7,598	265	3,592	12,780
Massachusetts	--	8,582	5,596	6,785	4	20,967
Michigan	2	3,105	20,699	11,593	16,296	51,695
Minnesota	--	707	15,247	8,570	78,518	103,042
Mississippi	--	425	29	--	913	1,367
Missouri	--	7,427	10,995	39,716	77,691	135,829
Montana	15	1,800	3,413	1,590	114,864	121,682
Nebraska	--	267	509	686	4,144	5,606
Nevada	--	1,901	4,050	6,641	106,723	119,315
New Hampshire	--	2,168	802	1,910	--	4,880
New Jersey	--	2,762	3,819	2,310	44,192	53,083
New Mexico	8	3,469	15,958	595	93,964	113,994
New York	--	4,857	6,357	5,292	3,864	20,370
North Carolina	--	5,447	13,014	5,273	54,623	78,357
North Dakota	--	109	--	--	--	109
Ohio	45	5,106	24,825	60,484	161,925	252,385
Oklahoma	4	804	6,298	23,652	7,685	38,443
Oregon	--	1,894	1,122	4,484	15,809	23,309
Pennsylvania	838	14,496	60,324	54,985	193,077	323,720
Rhode Island	--	530	602	3,543	--	4,675
South Carolina	--	287	2,124	429	--	2,840
South Dakota	--	50	340	1,157	11,801	13,348
Tennessee	382	7,532	10,371	39,933	33,137	91,355
Texas	--	3,808	4,795	8,464	65,987	83,054
Utah	94	2,315	2,948	226	39,050	44,633
Vermont	--	757	508	588	--	1,853
Virginia	4,389	5,910	15,624	12,892	135,753	174,568
Washington	--	3,799	5,629	15,252	21,652	46,332
West Virginia	4,340	3,743	29,160	101,294	307,465	446,002
Wisconsin	--	1,835	2,209	857	14,496	19,397
Wyoming	33	3,096	63,145	16,273	195,775	278,322
Total	27,670	150,769	658,273	867,393	2,973,801	4,677,906

<sup>1</sup>Included with Maryland.

Fig. 1.-Supply trends U.S. industrial explosives  
(Thousand short tons)

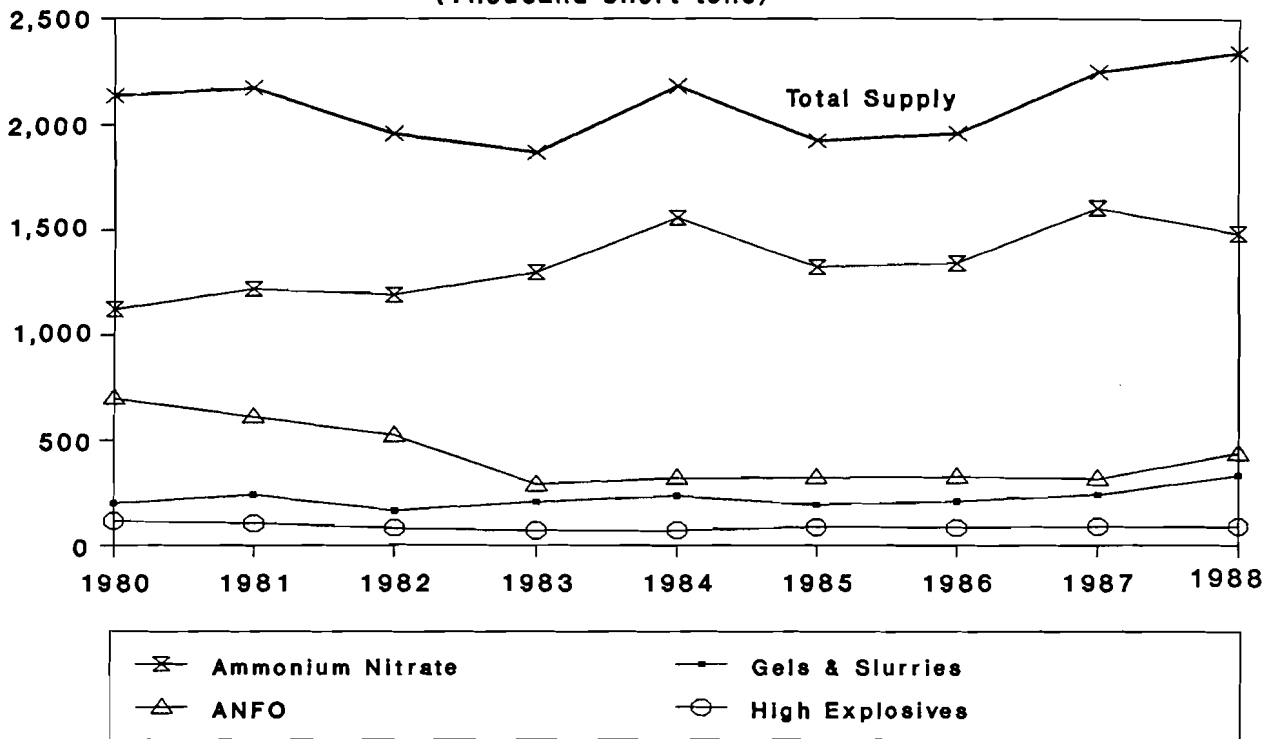


Table 4.- Supply trends U.S. industrial explosives  
(Thousand short tons)

Calendar Year	Ammonium Nitrate	ANFO	Water Gels & Slurries	Other High Explosives	Permissibles	Total Supply <sup>1/</sup>
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	1,487	434	329	75	14	2,339

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

Source: Branch of Industrial Minerals, Chemical Materials Section, Bureau of Mines.

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Fig. 2.-Demand trends U.S. industrial explosives  
 (Thousand short tons)

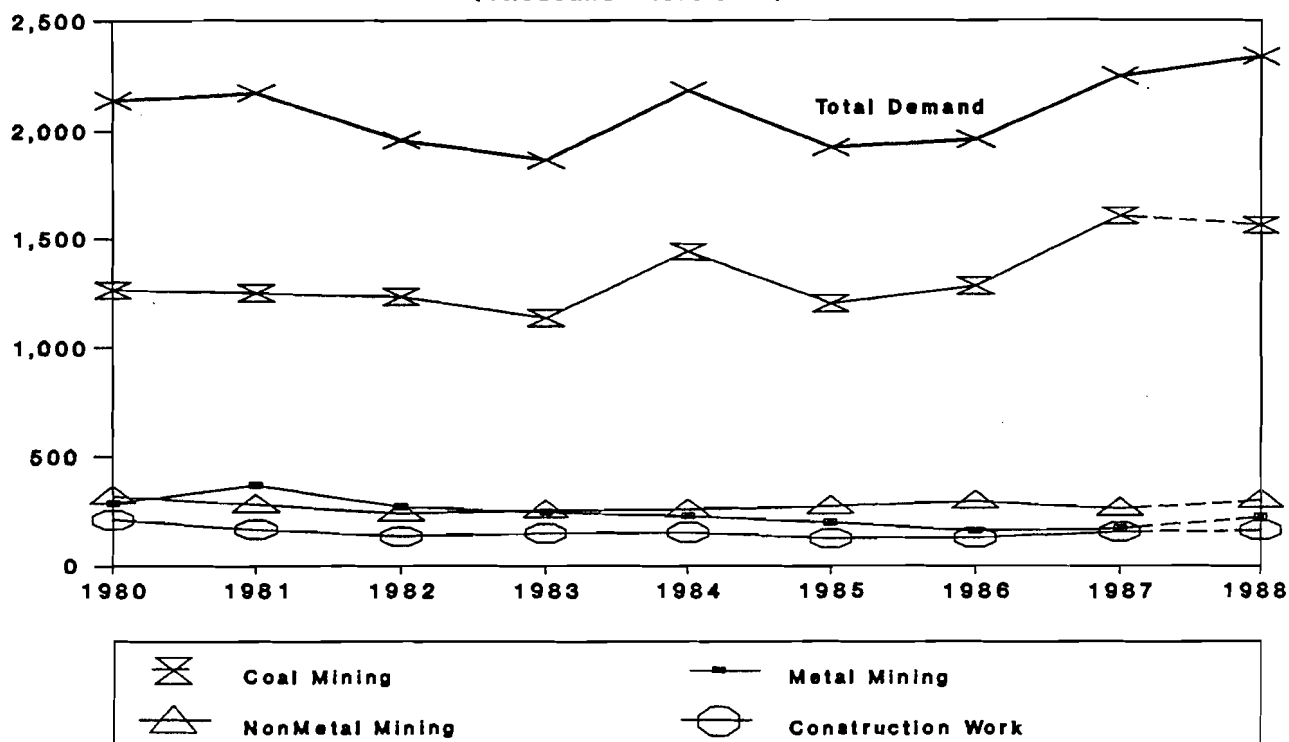


Table 5.- Demand trends U.S. industrial explosives  
 (Thousand short tons)

Calendar Year	Coal Mining	Quarrying & NonMetal Mining	Metal Mining	Construction Work	Other Purposes	Total Demand <sup>1/</sup>
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
1988e/	1,568	295	220	160	95	2,339

e/Estimated.

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

Source: Branch of Industrial Minerals, Chemical Materials Section, Bureau of Mines.