Growth slows in Top 50 chemicals' output

Total output reached about 410 billion pounds last year, but growth of 4% was less than half that of year before

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The steady stream of annual reports that has flowed out of chemical companies' headquarters recently indicates that 1973 was a joyous one for the industry in terms of profits. But this year's list of the Top 50 chemical products paints a somewhat different picture for chemical output last year. The list clearly marks 1973 as the year in which the chemical industry had to learn to live with shortages, a life style it may have to contend with for several years to come.

A chemical company vice president recently told C&EN, "We aren't taking customers out to lunch anymore. We're wining and dining our suppliers." He was laughing when he said it, but he probably wasn't joking.

The Top 50 list shows why. Run your finger down the growth rate columns. For 11 chemical products, production declined in 1973. By comparison, only four sported minus signs for 1972 (C&EN, May 7, 1973, page 8), year of the great recovery for the chemical industry. Moreover, of the entire 50 products on the list, only 13 had higher growth in output in 1973 than they had the preceding year. On last year's list, 41 products had higher growth rates.

Overall, the growth rate last year for the 50 products was only about half what it had been in 1972. The total volume of production for all 50 chemicals was up 4.1% in 1973, compared to an increase of 9.7% during 1972.

Production of all the 50 chemicals on C&EN's list totaled more than 400 billion pounds. That is a solid foundation upon which to gage the industry's performance. The list has been an excellent barometer of chemical production in past years and this year is no exception, even though the readings may not be to the industry's liking.

In the past, whenever chemical production tapered off, the reason could usually be found in the general health of the economy. Lower production growth rates usually accompanied a recession, or at least a business slowdown when demand for chemical products just wasn't there.

Not so in 1973. The valve that limited production growth was on the supply end of the flow chart, not the demand end. This was particularly true of organic chemicals where shortages of crude oil and natural gas, and the Arab oil embargo put a squeeze on petrochemical feedstocks. The Top 50 list reflects this dramatically. Of the 30 organics, only five had higher growth rates in 1973 than they did in 1972. Among inorganic chemicals, with only 20 products on the list, eight chemicals grew faster last year than they did the preceding year.

Ethylene and its derivatives provide a good example of the chain reaction caused by the shortage of hydrocarbon raw materials. Last year ethylene output hit 22.4 billion pounds, tops among the organics. But that represents a growth of only 7.4%, compared to 13% the year before. Faced with a shortage of ethylene, companies that used it as feedstock had a decision to make. Which of their products would get the ethylene that was available?

The obvious answer was those products that yield the greatest profit margin. The Top 50 list and the accompanying list of plastics show what happened. Output of high-density polyethylene jumped 20.8% and that of low-density polyethylene advanced 10%, good growth even though less than occurred in 1972. However, other downstream products suffered. Ethylene oxide output was down 1.9%, compared to a 9.8% increase in 1972. Ethylene glycol production was down 0.3%; it was up 7.5% in 1972. Ethanol output was up 5.1% last year, only a third the growth it displayed in 1972.

About the Top 50 list

C&EN compiles its list of the Top 50 chemical products on the basis of production volume, using government and trade association sources for data when they are available and C&EN estimates when data are incomplete. Each product's ranking for the previous year (in this case 1972) has been revised to reflect changes in statistics and may not coincide exactly with its rank as published in last year's Top 50 table.

All basic, intermediate, and chemically homogeneous finished products are candidates for the list. These range from petrochemical building blocks, such as ethylene and propylene, to such derivative products as ethylene glycol and vinyl acetate. The list includes basic inorganics, such as sulfuric acid and caustic soda, but excludes basic minerals (for instance, salt, lime, potash, gypsum, and sulfur). It also excludes such petrochemical feedstocks as ethane, propane, and butane because they are largely products of the oil and gas industry and have many nonchemical uses.

Admittedly, the list contains some gray areas. Basic aromatic chemicals—benzene, toluene, and xylene, in particular—make the purely chemical nature of the list less pure. This year, C&EN chose to keep benzene, toluene and xylene (all grades) on the list. However, for the first time, it also considered as candidates *p*-xylene (which had enough production volume itself to make the list) and *o*-xylene (which did not make it).

This year, the companion table of plastics, synthetic fibers, and synthetic rubber has been expanded. Consequently, several plastics have been omitted from the Top 50 table. Some, such as polyethylene, probably are qualified candidates for the Top 50 table. Others, such as polyvinyl chloride and its copolymers, probably aren't sufficiently distinct chemical entities to be on the list. For consistency, however, all plastics were excluded from the list, thus opening up several spots for "purely chemical" candidates. In the future, additional changes may be made to eliminate further gray areas. The process is limited, however, by availability of statistics.

The commonly used units of measurement (pounds, gallons, cubic feet) have been converted to billions of pounds to provide an accurate ranking and easy comparison. However, the more familiar units of measurement also are listed, as well as growth rates for the most recent year, previous year, past five years, and past 10 years.

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The Top 50 chemicals: inorganics dominate in tonnage if not in number

Rank 1973	Rank 1972[a]	Chemical	Production (Billions of pounds) 1973	Production (Billions of pounds) 1972[a]	Production (Common units[b]) 1973	Production (Common units[b]) 1972[a]	Average annual change 1972-73	Average annual change [illegible]	Average annual change [illegible]	Average annual change [illegible]
1	1	**Sulfuric acid**	63.18	62.60	31,588 tt	31,300 tt	0.9%	7.8%	2.0%	4.2%
2	3	**Oxygen,** high and low purity	31.87	29.22	385 bcf	353 bcf	9.1	10.7	9.2	11.6
3	2	**Ammonia,** synthetic anhydrous	30.94	30.39	15,468 tt	15,193 tt	1.8	4.5	5.8	8.7
4	4	**Ethylene**	22.41	20.85	22,405 mp	20,852 mp	7.4	13.0	11.3	11.5
5	5	**Sodium hydroxide,** 100% liquid	21.36	20.43	10,678 tt	10,217 tt	4.5	5.7	3.8	6.3
6	6	**Chlorine,** gas	20.60	19.75	10,302 tt	9,873 tt	4.3	5.6	4.1	6.6
7	9	**Nitrogen,** high and low purity	16.38	14.06	226 bcf	194 bcf	16.5	15.5	13.7	16.1
8	8	**Sodium carbonate,** synthetic and natural	14.99	14.88	7,496 tt	7,439 tt	0.8	4.0	2.5	2.6
9	7	**Nitric acid**	14.86	15.96	7,430 tt	7,981 tt	−6.9	4.5	1.2	5.8
10	10	**Ammonium nitrate,** original solution	13.89	13.76	6,943 tt	6,881 tt	1.3	3.7	3.9	5.7
11	11	**Phosphoric acid,** total	13.00	13.06	6,498 tt	6,531 tt	−0.5	9.4	4.3	8.4
12	12	**Benzene,** all grades	10.65	9.18	1,453 mg	1,252 mg	16.1	16.4	7.8	8.4
13	14	**Propylene**	8.76	8.47	8,764 mp	8,472 mp	3.4	22.9	4.5	12.4
14	13	**Ethylene dichloride**	7.90	8.60	7,903 mp	8,600 mp	−8.1	13.8	10.5	16.0
15	15	**Urea,** primary solution	7.12	6.95	7,120 mp	6,950 mp	2.4	9.2	7.9	12.4
15	18	**Methanol,** synthetic	7.12	5.96	7,118 mp	5,956 mp	19.5	20.3	13.3	11.8
17	16	**Toluene,** all grades	6.78	6.63	936 mg	916 mg	2.2	4.6	6.1	8.7
18	17	**Ethylbenzene**	6.50[a]	6.43[a]	6,500 mp[a]	6,425 mp[a]	1.2	28.9	10.0	10.2
19	20	**Formaldehyde,** 37% by weight	6.17	5.65	6,173 mp	5,650 mp	9.3	24.5	7.5	9.3
20	19	**Styrene**	6.01	5.95	6,014 mp	5,950 mp	1.1	27.1	10.2	10.8
21	21	**Xylene,** all grades	5.50	5.33	818 mg	738 mg	10.7	20.8	8.8	9.3
22	22	**Vinyl chloride**	5.35	5.18	5,340 mp	5,175 mp	3.3	18.3	12.5	14.1
23	23	**Hydrochloric acid,** total	4.78	4.60	2,390 tt	2,302 tt	3.8	9.2	6.5	8.5
24	25	**Ammonium sulfate**	3.97	3.72	1,985 tt	1,[illegible] tt	6.6	2.6	−0.2	5.1
25	24	**Ethylene oxide**	3.88	3.95	3,876 mp	3,[illegible] mp	−[illegible]	[illegible]	8.1	7.5
26	26	**Butadiene (1,3-),** rubber grade	3.60	3.53	3,[illegible] mp	3,[illegible] mp	3.[illegible]	[illegible]	4.5	4.7
27	28	**Carbon black**	3.50	3.22	3,[illegible] mp	3,[illegible] mp	[illegible]	[illegible]	4.6	6.4
28	27	**Ethylene glycol**	3.29	3.30	3,[illegible] mp	3,[illegible] mp	−0.3	7.6	10.7	7.1
29	30	**Sodium sulfate,** high and low purity	2.85	2.65	1,426 tt	1,327 tt	7.5	−2.[illegible]	−0.8	1.5
30	29	**Carbon dioxide,** all forms	2.77	2.96	1,387 tt	1,48[illegible] tt	−6.[illegible]	[illegible]	5.6	[illegible]
31	38	**Dimethyl terephthalate**	2.69[a]	2.0[illegible][a]	2,[illegible] mp	[illegible]	[illegible]	[illegible]	19.9	[illegible]
32	32	**Cumene**	2.67	2.3[illegible][a]	2,[illegible] mp	[illegible]	−[illegible]	[illegible]	14.[illegible]	[illegible]
33	39	**Terephthalic acid**	2.4[illegible][a]	2.0[illegible][a]	2,[illegible] mp	[illegible]	[illegible]	27.4	21.2	[illegible]
34	36	**Acetic acid**	2.42	2.19[a]	2,4[illegible] mp	2,[illegible] mp	[illegible]	[illegible]	[illegible]	[illegible]
35	33	**Calcium chloride,** solid and liquid	2.4[illegible][a]	2.3[illegible]	[illegible]	[illegible]	[illegible]	−[illegible]	0.7	2.7
36	34	**Cyclohexane**	2.3[illegible]	2.2[illegible][a]	2,[illegible]	[illegible]	[illegible]	[illegible]	2.9	8.1
37	35	**p-Xylene**	2.3[illegible]	2.2[illegible]	2,[illegible] mp	[illegible]	[illegible]	[illegible]	12.0	20.3
38	31	**Aluminum sulfate,** commercial	2.2[illegible]	2.5[illegible]	1,[illegible]	[illegible]	−[illegible]	[illegible]	−0.[illegible]	1.8
39	40	**Phenol,** total	2.20	2.0[illegible]	2,[illegible]	1,[illegible]	10.7	15.[illegible]	8.2	9.[illegible]
40	43	**Acetone**	1.90	1.75	1,[illegible] mp	[illegible]	[illegible]	[illegible]	7.8	7.7
41	41	**Ethanol,** synthetic	1.97[a]	1.8[illegible][a]	1,[illegible] mp	1,[illegible] mp	[illegible]	10.7	−3.7	6.1
42	37	**Sodium tripolyphosphate**	1.88	2.07	[illegible] tt	1,[illegible] tt	−[illegible]	−6.7	−5.0	1.2
43	42	**Isopropanol**	1.76	1.80	1,7[illegible] mp	1,[illegible] mp	−[illegible]	7.5	−3.3	1.8
44	45	**Propylene oxide**	1.75	1.51	1,7[illegible] mp	1,5[illegible] mp	15.[illegible]	20.[illegible]	12.8	19.4
45	44	**Acetic anhydride**	1.59	1.65	1,[illegible] mp	1,[illegible] mp	−[illegible]	1.2	−1.9	2.6
46	46	**Titanium dioxide**	1.54	1.44	77[illegible] tt	[illegible]	[illegible]	[illegible]	4.3	4.0
47	50	**Vinyl acetate**	1.48	1.20	1,4[illegible] mp	1,2[illegible] mp	[illegible]	[illegible]	18.6	13.9
48	48	**Sodium silicate** (water glass)	1.46	1.32	73[illegible]	[illegible]	[illegible]	5.[illegible]	2.9	2.8
49	49	**Acetaldehyde**	1.40[a]	1.30[a]	1,40[illegible] mp	1,3[illegible] mp	7.7	−[illegible]	−2.6	2.8
50		**Acrylonitrile**	1.35	1.12	1,3[illegible] mp	1,12[illegible] mp	[illegible]	[illegible]	5.8	11.5

a Revised. b tt = thousand tons, bcf = billion cubic feet, mp = million pounds, mg = [illegible] Sources: Bureau of the Census, Bureau of Mines, and Tariff Commission

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Production of another important ethylene derivative—ethylene dichloride—was down 8.1% last year, but a critical shortage of chlorine contributed as much to that decline as did the shortage of ethylene. Output of ethylbenzene was held to a low 1.2% gain, not only because of a lack of ethylene, but because of a tight benzene situation. In 1972 ethylbenzene production increased a hefty 28.9%. The ethylbenzene shortage, in turn, dropped the growth in styrene production from 27.1% during 1972 to only 1.1% in 1973.

Two products that were able to weather the general shortage of aromatics were terephthalic acid and dimethyl terephthalate. Both are raw materials for polyester, the stellar performer of man-made fibers. Polyester fiber output jumped 24% last year to 2.9 billion pounds, and production of terephthalic acid and dimethyl terephthalate jumped right along with it by 23.6% and 30.9%, respectively.

Although production of organics suffered more than that of inorganics in 1973 as a result of shortages, the organics as a group are still growing much faster. There are 30 organics on this year's Top 50 list; only four years ago there were 24. On a volume basis, the organics on the Top 50 list increased their output 6.8% in 1973, but the inorganics only advanced 2.7%. Both the five-year and the 10-year average growth rates are higher for organics than for inorganics.

But what the inorganics lack in growth, they more than make up in sheer volume. They account for better than 65% of the 410 billion pounds of production of all products on the Top 50 list. Sulfuric acid, the perennial volume leader, alone accounts for 63 bil-

Plastics, synthetic fibers, and rubber provide 38 billion pound market for chemicals

	PRODUCTION (Billions of pounds)	PRODUCTION (Common units[a])					AVERAGE ANNUAL CHANGE			
	1973	1973	1972	1971	1968	1963	1972–73	1971–72	1968–73	1963–73
PLASTICS										
Thermosetting resins										
Epoxies (unmodified)	0.22	223	184	169	158	81	21.2%	8.9%	7.1%	10.6%
Polyesters (unsaturated)	1.05	1,051	933	730	615	255	12.6	27.8	11.3	15.2
Urea resins	0.87	867	739	636	816[c]	518[c]	17.3	16.2	4.9[c]	7.2[c]
Melamine resins	0.17	170	171	168	[c]	[c]	−0.6	1.8	[c]	[c]
Phenolic and other tar acid resins	1.39	1,387	1,453	1,194	1,097	741	−4.5	21.7	4.8	6.5
Thermoplastic resins										
Polyethylene										
Low-density	5.80	5,803	5,274	4,458	3,306	1,754	10.0	18.3	11.9	12.7
High-density	2.64	2,637	2,325	1,924	1,261	516	13.4	20.8	15.9	17.7
Polypropylene and copolymers	2.16	2,162	1,726	1,288	878	197	25.3	34.0	19.8	27.2
Styrene and copolymers	5.02	5,022	4,671	3,748	2,896	1,494	7.5	24.6	11.7	12.9
Polyvinyl chloride and copolymers	4.56	4,562	4,259	3,471	2,635	1,386	7.1	22.7	11.6	12.7
TOTAL[b]	**20.19**	**20,186**	**18,255**	**14,889**	**10,976**	**5,347**	**10.6%**	**22.6%**	**13.0%**	**14.2%**
TOTAL PLASTICS[b]	**23.88**	**23,884**	**21,735**	**17,786**	**13,662**	**6,942**	**9.9%**	**22.2%**	**11.8%**	**13.2%**
SYNTHETIC FIBERS										
Cellulosics										
Rayon	0.90	895	965	915	1,104	979	−7.3	5.5	−4.1	−0.1
Acetate	0.46	462	429	476	490	370	7.7	−9.9	−1.2	2.2
TOTAL	**1.36**	**1,357**	**1,394**	**1,391**	**1,594**	**1,349**	**−2.7%**	**0.2%**	**−3.0%**	**0.1%**
Noncellulosics										
Nylon	2.18	2,175	1,975	1,595	1,350	692	10.1	23.8	10.0	12.1
Acrylic[d]	0.74	742	626	545	521	210	18.5	14.9	7.3	13.4
Polyester[e]	2.90	2,901	2,339	1,831	1,094	220	24.0	27.7	21.5	29.5
Olefin[f]	0.49	492	417	322	264	35	18.0	29.5	13.3	30.5
Glass fiber	0.69	689	572	468	403	192	20.5	22.2	11.3	13.6
TOTAL	**7.00**	**6,999**	**5,929**	**4,761**	**3,632**	**1,349**	**18.0%**	**24.5%**	**14.0%**	**17.9%**
TOTAL SYNTHETIC FIBERS	**8.36**	**8,356**	**7,323**	**6,152**	**5,226**	**2,698**	**14.1%**	**19.0%**	**9.8%**	**12.0%**
SYNTHETIC RUBBER										
Styrene-butadiene[g]	3.39	1,512	1,476	1,416	1,389	1,159	2.4	4.2	1.7	2.7
Butyl	0.35	157	129	106	113	108	21.7	21.7	6.8	3.8
Nitrile	0.19	83	73	65	71	48	13.7	12.3	3.2	5.6
Polybutadiene	0.74	332	294	254	217	139[j]	12.9	15.7	8.9	15.1[j]
Polyisoprene	0.26	117	132	117	140[i]	[j]	−11.4	12.8	10.9[i]	[j]
Ethylene-propylene	0.26	118	90	60	[i]	[j]	31.1	50.0	[i]	[j]
Neoprene and other[h]	0.60	266	223	222	201	154	19.3	0.5	5.8	5.6
TOTAL SYNTHETIC RUBBER	**5.79**	**2,585**	**2,417**	**2,240**	**2,131**	**1,608**	**7.0%**	**7.9%**	**3.9%**	**4.9%**

a Plastics and synthetic fibers, million pounds; synthetic rubber, thousand long tons. b Totals are only for those products listed. Totals may not add because of rounding. c Includes melamine and urea. d Includes modacrylic. e Includes small amounts of anidex, saran, spandex, vinyon, and TFE-fluorocarbon yarn and monofilament. f Includes vinyon staple and tow. g Excludes high-styrene latex. h Includes chlorosulfonated polyethylene, polyisobutylene plus acrylic, fluoro, polysulfide, and silicone elastomers. Excludes polyurethane elastomers. i Includes polyisoprene and polybutadiene. j Includes polybutadiene, polyisoprene, and ethylene-propylene. Sources: Society of the Plastics Industry, Tariff Commission, Textile Economics Bureau, Rubber Manufacturers Association, and Bureau of the Census

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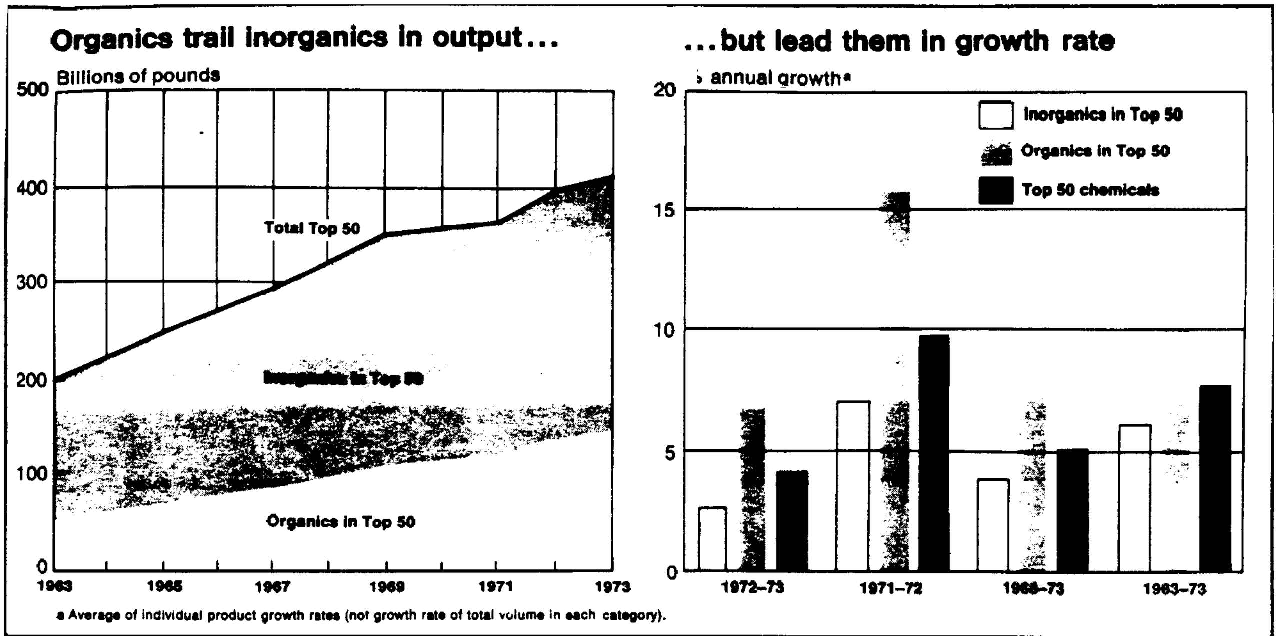
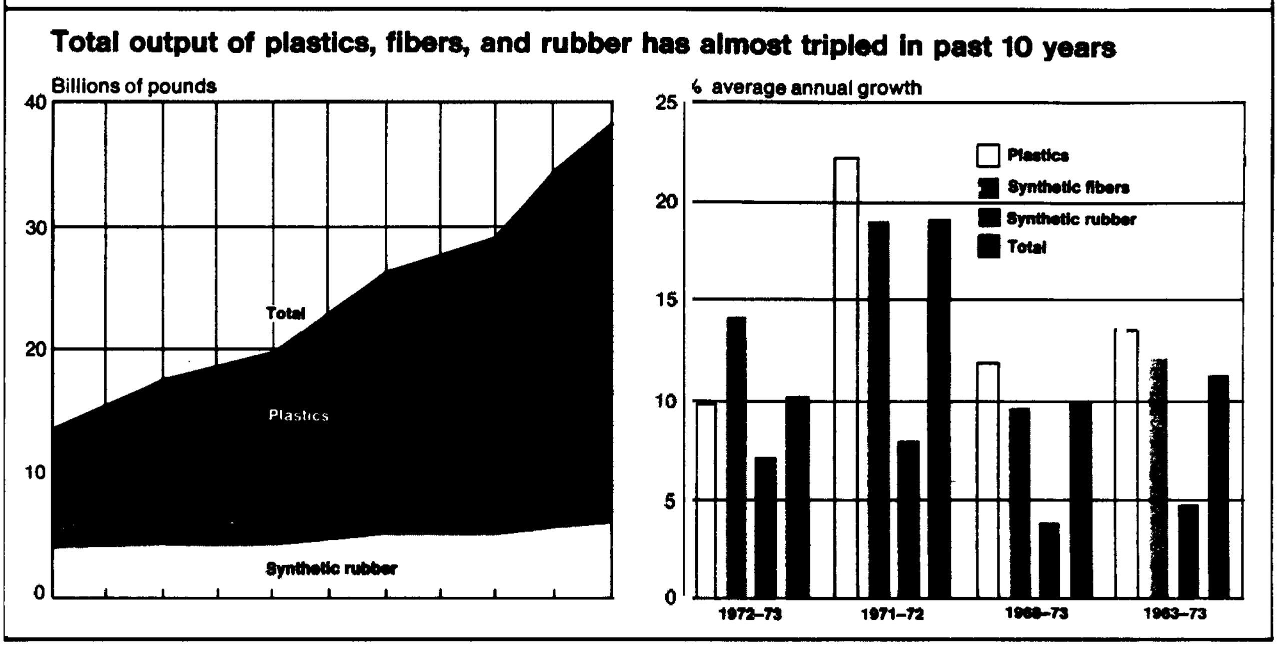


a Average of individual product growth rates (not growth rate of total volume in each category).



lion pounds of the total production, more than twice as much as does ammonia, the second-ranked product. And the fact that sulfuric acid output was held to only a 0.9% gain last year is one reason why the inorganics as a whole registered their relatively low overall growth.

Although most of the inorganics increased between 2 and 7%, as they usually do, some of them stood above the crowd. The industrial gases, oxygen and nitrogen, scored gains of 9.1% and 16.5%, respectively. And sodium silicate (water glass) jumped 10.4%. However, phosphorus (white and red), which was on the list last year, couldn't generate enough volume this year to be ranked among the 50 leading products.

This year, it took a production of 1.35 billion pounds to make the Top 50 list. Last year, 1.13 billion pounds was sufficient. Unless some of the inorganics near the bottom of the list grow faster than their past long-term annual rate, they probably will be replaced on next year's list. Several billion-pound-plus organics, among them carbon tetrachloride, phthalic anhydride, adipic acid, and *o*-xylene, are pressing to take their places.

It will be interesting to watch what displacement, if any, occurs on next year's list. The lowest ranked inorganic is sodium silicate, in the 48th spot. If output increases this year only in line with its long-term growth trend, sodium silicate stands a good chance of being bumped from the list. However, production of sodium silicate jumped 10.4% last year, triple its 10-year average growth rate. If it comes even close to repeating this year, it would again be assured a spot on the list.

Of all the inorganics, sodium tripolyphosphate seems to be most likely to drop off the list. Production of STTP has been declining for the past several years, and it's only a matter of time before one of the unlisted organics passes it on its way down.

The two most likely organics to make the Top 50 list are *o*-xylene, which had an output of 1.07 billion pounds last year, and adipic acid. Adipic actually was ranked 47th on the 1972 list, but output plummeted almost 25% last year, knocking it out of the 1973 ranking.

PPG's Newton wins CMRA Memorial Award

Chemist turned marketing executive Wilbert F. Newton has seen chemical market research evolve from a relatively simple approach to production, capacity, and marketing problems to its present status as a sophisticated, if, in his view, not yet quite scientific, profession. "In 1945," the congenial corporate vice president for marketing at PPG Industries (then Pittsburgh Plate Glass Co.) recalls, "I was asked to come to Pittsburgh to start up a market research and development department for PPG's chemical division. My first question was: What does that mean?"

No one in the company could really answer him specifically, so Bill Newton had to set his own course. He soon became active in the Chemical Marketing Research Association (CMRA), then still a very informal group made up mostly of people equally inexperienced in the techriques of industrial market research. As he remembers it, "What we didn't understand, we sat around explaining to each other." Having been present at the creation of CMRA, nearly 30 years ago, Bill Newton will receive in New York City this week, CMRA's annual memorial award "in recognition of his outstanding contributions to the understanding, acceptance, methods, and knowledge of chemical marketing research."

His respect for marketing research has grown. "You may not always believe it," he admits, "but you don't dare ignore it, either. If nothing else, it points up the need by business for a lot of contingency planning."

Now, as head of all PPG's marketing activities and a member of its four-man management committee, Mr. Newton, 59, is no longer directly involved with selling the company's chemicals, coatings, glass, or glass fiber. The decentralized firm's four divisions have prime responsibility for their own sales, both in the U.S. and abroad, although when appropriate he may prod them a bit to move more aggressively. "But my major job," he explains, "is to contribute to the general growth, profitability, and welfare of the corporation."

This lofty-sounding mandate charges him with coördinating divisional long-range planning and requests for capital appropriations, as well as with keeping interdivisional channels of communication open. On his shoulders, also, is responsibility for PPG's relations with the outside world (including federal agencies) and overall corporate development. During a trip to Moscow last November, for example, he spearheaded PPG's negotiations with Soviet officials that led last month to the signing of a letter of intent with U.S.S.R. Minister of the Chemical Industry L. A. Kostandov. The agreement points the way toward cooperation in building a large-scale plastics complex (presumably involving PPG's vinyl chloride technology) and other industrial projects in the Soviet Union.

Perhaps because he is in charge of PPG's corporate relations activities, Mr. Newton is increasingly concerned about the tangled interface between big business and big government. "We have a system that operates, essentially, through interactions in the market place," he says, "with governmental activity increasingly regulating that market economy. The fundamental question, as I see it, is: How can we get whatever regulation is needed—and I tend to favor minimum regulation—yet permit the system to function effectively? How do we work, day-to-day, with regulatory actions and proposed legislation that affect our company interests, without in the longer term losing sight of the ultimate effect of government on our market system?"

He suggests, for one thing, that something similar to environmental impact statements be required of proposals for increasing taxes or regulating business that would spell out their economic impact. As chairman of the U.S. Chamber of Commerce's antitrust and trade regulation committee, he is particularly apprehensive about the potential threat he sees in Congressional proposals to broaden U.S. antitrust laws or to discourage overseas investment. He fears such moves will undercut the ability of U.S. companies to meet foreign competitors on an equal footing and also stifle foreign trade.

He also is disturbed about what appears to be an increasingly critical attitude toward big business on the part of the American public. He warns that industry spokesmen have done poorly in explaining how our business system operates, and he advocates a stepped-up research effort aimed at developing more facts and better perspectives on questions of markets and free enterprise. "I feel very strongly that businessmen must do a much better job of interpreting how they function and communicating an understanding of our economic system to the public, as well as working constructively with all the branches of government," he argues. "It can't be done just with a big publicity campaign to say how good we are, but must be based on solid information and reasoned insights."

Mr. Newton is convinced that such matters are not really as unrelated to industrial marketing and market research as they first might seem. "The impacts of government actions, consumer attitudes, and public opinion are very much a subject for careful analysis and interpretation," he points out, "and offer a tremendous challenge to business market research."

A native of Norfolk, Va., Bill Newton graduated with a B.S. in chemistry

Newton: lot of contingency planning

from the University of California, Berkeley, in 1937. He joined PPG in 1941 after working as a control and research chemist for Shell Chemical in Pittsburg, Calif. After four years at PPG's Barberton, Ohio, laboratory, doing research and pilot-plant work on resins and phosgene chemistry, he set up the chemical division's market research operation to explore potential outlets for a large number of interesting materials the research labs had on their shelves but which the company didn't then know what to do with.

This, in turn, led to his taking on the task of coordinating chemical marketing with the company's R&D efforts, a job that sparked, among other things, PPG's initial efforts to find captive uses for its large chlorine output by moving into chlorinated solvents, vinyl chloride, and similar derivatives. R&D, he became convinced, "should be directed primarily toward areas that the company has some reasonable prospect of exploiting commercially. Otherwise, it only leads to a lot of frustration." By 1956, Mr. Newton was director of PPG's chemical sales.

Then, in 1961, in a switch that perhaps was even sharper than his move from chemical to marketing research, Mr. Newton was named director of market planning for PPG's merchandising division. The division then handled most of the sales and distribution of the company's many paint and glass products. One of his assignments was to help restructure and simplify the company's paint and glass distribution systems, which hadn't changed very much in some 70 years. Eventually, the division was dissolved and its functions taken over by the glass and coatings divisions themselves. "I was able to bring to the problem of reorganization the objectivity of someone who had not been long immersed in the established system," he notes wryly. Mr. Newton later served two years as marketing

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