

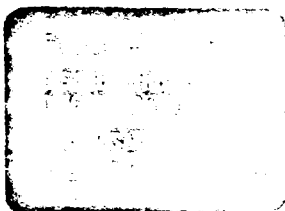


Supply Status Report No. 1:

PVC

**...will be tight until VCM gets loose,
VCM will be tight until ethylene gets loose**

What is the real growth picture for resins this year and beyond in the U.S.A.? In this issue, MODERN PLASTICS INTERNATIONAL launches a series of comprehensive supply analyses for each of the major polymers. These articles will track current resin capacity and planned expansions. But more importantly, they will dig into the supply situation and growth outlook for monomers and basic feeds. There you'll find most of the answers as to how much more resin there will be, how soon and at what price.



Right at the top, with all the bark on, this is how the polyvinyl chloride supply situation shapes up:

□ 1974 will be a slow-growth year for sales; maybe a 5% increase, compared with last year's 9.1%. Current polymer capacity is just barely 5% greater than the record PVC sales volume reached in 1973. Although there's a lot more new resin capacity scheduled to come on in the second half of this year (see table, right), much of that is iffy. And what does start up will be too late to make much of an impact on 1974 performance.

□ 1975-1976 also will be years of plodding sales increases, again likely not more than 5% annually. That's because capacities to produce vinyl chloride monomer (VCM) and ethylene feedstock will become increasingly insufficient to meet the needs of polymer capacity buildups. In a time of rising demand for all plastics, the ethylene shortfall will have a dampening effect across the entire resins spectrum.

□ 1977 looks like a crucial year. That's when PVC sales could get back to normal growth rates of 10 to 15% annually—IF improving profitability in petrochemicals loosens up more ethylene for the polymers sector, and IF a lot more ethylene and VCM new-plant investment is announced. The latter had better happen in a hurry; structural steel supply for grassroots construction has shortened up to the point where order backlogs are at a minimum of 36 months.

□ PVC pricing will continue to be forced upward, reacting to all the usual influences. General-purpose homopolymer could come close to the European selling price (27¢/lb.) within the next year. Although multitier pricing still prevails, the base price for PVC resin got up to an aver-

age of 17-18¢ after the January decontrol. And B.F. Goodrich, biggest U.S. producer, posted a bulk-volume list of 20¢/lb. for general-purpose resin on Mar. 29. That's about 50% higher than the prevailing price in May of 1973.

Feeling the pinch

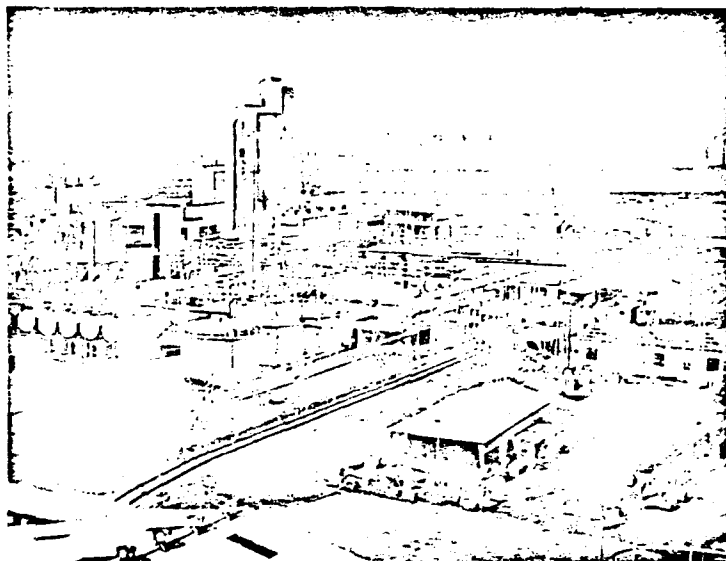
What it all adds up to is that PVC resin allocation is going to remain as a factor for producers and processors to cope with for at least the next two years. A lot of demand is going to go unsatisfied. Meanwhile, materials shortages and rising prices also could lead to considerable market dislocation, quite apart from the problems that have surfaced from federal action on workplace health-safety aspects of VCM, and on food-contact use of PVC (see p. 40).

There is, for example, some concern that PVC prices in excess of a 20¢/lb. base could curtail growth in the pipe and fittings market, which last year accounted for nearly 30% of total PVC sales volume. Price aside, the market for flexible vinyls has more to lose from the pervasive shortage of raw materials. Ethyl Corp., for example, has discontinued production of plasticized compounds. Critical shortages and fast-rising prices of such plasticizer building blocks as alcohol and phthalic anhydrides paint a picture of deepening gloom for this segment of the industry.

Analyzing the PVC capacity boom

Despite all of their backstream supply problems, U.S. producers of PVC, including a couple of new faces in the supply line-up, say that by early next year they will have about 28% more production capacity than the current 2,250,600 metric tons. It translates into a projected add-on of 626,500 tons (or 1.378 billion lb.). And that sounds like good news in view of demand acceleration. But the availability of VCM to feed domestic PVC plants this year and next will fall nearly 518,000 tons short of being sufficient to operate the new resin capacity at full efficiency. That's bad news. Moreover, the all-industries ethylene shortfall will get worse before it gets better. And that's really bad news.

The simple mathematics of the ethylene/VCM supply situation (see tables, p. 46) dictate that a large chunk of the oncoming new PVC capacity will not be operable for some time to come. Even accepting the unlikely hypothesis that VCM plants will run full-out and trouble-free throughout the rest of 1974, there doesn't seem to be any way in the world that domestic PVC sales this year can come close to 1973 performance, when sales rose to 2,151,000 tons; running almost 78,000 tons higher than total industry produc-



Capacity expansions at polymer level and more efficiency at monomer level mark current action in PVC. At left is view of Diamond Shamrock's Deer Park, Tex., plant, where 91,000 tons of new PVC capacity are coming on. At right, engineers at B. F. Goodrich's VCM plant in Calvert City, Ky., check progress of waste control/recovery units.

PVC producers talk up big new capacity for 1975, but tight VCM and ethylene will cut resin flow (see tables, p. 76)

tion for the year. The sales-to-production excess is the equivalent of a good-sized grassroots polymer facility.

Perhaps it may even be optimistic to talk of a 5% sales increase this year over last. Although it is much too soon to attach any significance to it for the year-long haul, early 1974 sales of PVC were off more than 4% from the comparable period in 1973. Production was off by 0.2%.

VCM and ethylene: short rations

The situation that pertains for PVC supply right now is that of transition from a lack of sufficient polymer capacity to a lack of sufficient feedstock/monomer capacity. Unless things turn around in a hurry at the infeed end, the only pragmatic long-term outlook is one of painfully achieved growth—certainly well below the year-to-year 8% increases that would be required to meet the rosy projections that were current as recently as two years ago. At that time, consensus was that domestic consumption of PVC would reach 3,635,000 tons by 1980, and 14,000,000 tons by the turn of the century.

When all is said and done, you have to go back and look at what is happening in the way of supply buildup for the constituents on which PVC is dependent: ethylene (hence VCM), and chlorine.

The good news (at least for customers situated close to the Gulf) is that chlorine is rebounding from a period of depressed supply. Plant additions will bring on approximately 5,000 tons/day of new capacity by the end of 1974, a gain of almost 17% from what it was at the beginning of this year. However, the bulk of the add-ons are slated for

Producer	Current capacity, 1,000 metric tons	Planned additions, 1,000 metric tons	Expected starting date	Projected capacity, Jan. 1, 1975, 1,000 metric tons
B.F. Goodrich	418.1	—	—	432.0
Firestone	181.8	22.7	1975	181.8
Conoco	172.7	22.7	4th Q, 1974	195.4
Diamond Shamrock	163.6	90.9	1st Q, 1975	163.6
Union Carbide	159.1	—	—	159.1
Borden Chemical	156.8	90.9	4th Q, 1974	247.7
Robintech	113.6	100.0	3rd Q, 1974	213.6
Tenneco	109.1	109.1	4th Q, 1974	218.2
Air Products	90.9	a	—	90.9
Goodyear	90.9	45.5	3rd Q, 1974	136.4
Hooker/Ruco	90.9	a	—	90.9
Ethyl	77.3	b	3rd Q, 1974	90.9 ^c
Stauffer	72.7	b	1976	72.7
Olin Corp.	68.2	—	—	68.2
American Chemical	63.6	—	—	63.6
Uniroyal	59.1	—	—	59.1
Pantasote	54.5	—	—	68.1
General Tire & Rubber	53.2	—	—	56.8
Great American	31.8	—	—	31.8
Keysor-Century	22.7	—	—	22.7
Atlantic Tubing & Rubber	—	22.7	2nd Q, 1974	22.7
Certain-Teed	—	90.9	4th Q, 1974	90.9
Georgia Pacific	—	100.0	4th Q, 1974	100.0
Total	2,250.6	695.4	—	2,877.1

Source: Individual producers, and Modern Plastics estimates.

a—Proposed expansion, in abeyance.

b—Unspecified expansion, under way.

c—Low estimate.

VCM: The numbers seem okay until you figure the shrinkage

Producer	1974 capacity, 1,000 metric tons	1975 expansions, 1,000 metric tons
Shell Chemical	681.8	↑ None announced ↓
Dow Chemical	636.3	
B.F. Goodrich	454.5	
PPG Industries	409.1	
Conoco	284.1	
Ethyl	204.5	
Monochem	159.1	
Allied Chemical	136.4	
American Chemical	77.3	
Total	3,043.1	
Correcting for 90% operating level	-304.3	
Subtotal	2,738.8	
5% lost in polymerization	-152.2	
Subtotal	2,586.6	
Estimated 1974 exports	-136.3	
Subtotal	2,450.3	
Other uses of VCM	-90.9	
Total for PVC conversion	2,359.4	

Source: Individual producers, and Modern Plastics estimates.

the fourth quarter, so tightness will persist through most of 1974. Also, chlorine production is highly energy intensive; with electricity costs getting into big numbers, this component will add its measure to the cost of a pound of resin. A year or so ago, chlorine was selling at discount levels of \$70/ton. Now it's reported at over \$80 and climbing. But at least the outlook seems to be one of assured availability.

The same cannot be said for VCM and its critical precursor: ethylene. Not yet, anyway.

Total current U.S./Puerto Rico capacity for VCM is a little higher than 3,000,000 tons/yr. Again, that sounds like a lot. But it assumes full operating efficiency at all plants throughout the year, which has not been the course of recent history. So when you correct for more realistic operating level, for polymerization loss, for exports, and for nonplastic uses of VCM, total monomer available for conversion to PVC shrinks down to a figure that is only marginally higher than existing U.S. PVC capacity.

Only one VCM expansion of any consequence was made last year: Shell's 320,000-ton facility at Norco. Nothing else is scheduled in the U.S. for this year or next. Virtually all capacity is committed. And since it takes one "Shell-sized" plant each year to support an annual PVC growth rate of 12%, it doesn't take much brainpower to calculate that 1975 and 1976 will be tough years to make or buy enough resin. There's a possibility that new federal standards reducing VCM exposure levels to 50 p.p.m., coupled with other industry efforts at tightening down on monomer loss, could have the effect of adding 100,000 tons/yr. or so to VCM supply. But the real effort must come from a capacity buildup by monomer producers. Although a number of them say they are studying the possibilities, only one such investment (and it is anonymous for now) has been made, for a 1976 start. Key question: Where's the ethylene?

It's a good one, because the ethylene supply situation is particularly grim. Some new plants have been announced as coming on between now and 1977 (but only one this year), with several slated to operate with mixed feeds, and at least one big one to be based on heavy gas oil, with an increased propylene fraction. But the trend to heavy feeds, if there is one, isn't nearly so important as the fact that new ethylene capacity coming on through 1977 looks like it will fall far short of providing enough feedstock to satisfy the demand for PVC and other polymers.

Based solely on the reasonable expectation that ethylene use will increase 8 to 10% annually, three new plants (455,000 tons each) will be needed annually between now and 1980. But it simply isn't working out that way, with tight supply projected through 1977 at least.

Better days coming?

Will there be more feedstock available for PVC? In the end, it will depend on firm establishment of financial incentives to new plant construction. That's basic. And the glimmerings are there. Pricing of both VCM and ethylene have doubled over the past year, making them more attractive to basic producers (who also have to abide by federal fair-allocation standards). And while domestic monomer/resin prices still don't measure up to overseas levels, the gap is narrowing. This is reflected in declining exports of PVC and VCM.—ROLAND R. MACBRIDE

Coming next month: Styrenics

Ethylene: more coming on, but not enough to go round

Year	All-industry demand, 1,000 metric tons	Production capacity, 1,000 metric tons	Real production (90% operating level), 1,000 metric tons	Supply-to-demand situation, 1,000 metric tons
1972	9,363.6	10,045.4	9,045.5	-318.1
1973	10,181.8 ^a	11,000.0	9,909.1	-272.7
1974	11,000.0 ^a	11,181.8 ^b	10,090.9	-909.1
1975	12,000.0 ^a	11,818.1 ^c	10,631.8	-1,368.2
1976	13,045.4 ^a	13,727.3 ^d	12,272.7	-772.7
1977	14,227.3 ^a	14,409.1 ^e	12,954.5	-1,272.8

Source: Union Carbide and other industry producers.

a—1974-1977 projections based on average 9% annual demand increase.

b—1974 addition scheduled: Texas Eastman (204,545 tons).

c—1975 additions scheduled: Amoco (454,545 tons), and Mobil (204,545 tons).

d—1976 additions scheduled: Arco (590,909 tons); Gulf (545,454 tons);

Texaco (454,545 tons); Shell (272,727 tons).

e—1977 additions include 682,000 tons of new capacity tentatively planned, but not yet committed.

The vinyl chloride fight is on

Chemical companies are filing objections to the Occupational Safety and Health Administration's proposed permanent exposure standards for vinyl chloride (*CW*, May 15, p. 25). But despite the outlook for prolonged hearings and accumulated data from many studies, OSHA is still hoping to adopt the standards, which call for "no detectable level" of VCM, by October.

Calling the proposed standards "impractical," "unachievable" and "a disaster for the industry," producers of vinyl chloride and polyvinyl chloride are basing objections on three main points. These are, they allege, the unavailability of manufacturing technology to eliminate VCM completely, the economic impact on the industry (they contend that plants will be closed, jobs and markets lost) and lack of data to support the new rules.

But industry chances of changing the standards appear to be getting worse, if last week's New York Academy of Sciences meeting on toxicity of VCM and PVC is any indication. Charges of blood, liver and respiratory abnormalities resulting from exposure to vinyl chloride were added to the known cases of angiosarcoma.

Standard Setting: The new standards proposed by OSHA define "no detectable exposure level" as being determined by devices capable of detecting concentrations of 1 ppm, with an accuracy of 1 ppm., plus or minus 50%. "That's going to be tough to achieve," says Daniel Boyd, director of the agency's standards development office.

But Boyd observes that a combination of engineering controls, work practice methods and respirators could be used in complying with the rules. The standards would put plants in three categories: those at which "feasible engineering controls" would be used to reduce exposure below detectable levels, those at which respirators would supplement work practice and engineering changes, and those at which respirators alone would be used because "no feasible engineering control or work practice method can be instituted immediately."

But industry is saying that these categories are not practical. Reason: there is no technology available to completely eliminate exposure, so there has to be reliance on respirator systems. And these, industry adds, are dangerous and won't work. "Maybe we can build a new plant to approach the proposed standards,"

says Harry Connors, general manager of Diamond Shamrock's plastics division, "but we can't adapt existing plants to it."

More Studies: What choice is left to industry? The answer could come from a series of economic impact studies that are being undertaken.

One will be done by OSHA, although a contractor to do the work has not yet been hired. The Society of the Plastics Industry has hired Arthur D. Little to study the economic impact of the new regulations. That study could be ready within two months.

In formulating its VCM rules, OSHA relied heavily on evidence of development of angiosarcoma in mice at 50-ppm. exposure during tests sponsored by the Manufacturing Chemists Assn. at Industrial Biotest Labs. And now those labs and those of Cesare Maltoni, in Bologna, Italy, are going to run further tests on mice at 25, 10 and 5 ppm. But the industry contends that much of this data doesn't relate to human exposure. Connors cites cases of 17 workers at Diamond Shamrock's Deer Park, Tex., plant who have had 20 years' exposure, he says, without damage.

Also under investigation is emissions of vinyl chloride from manufacturing plants. The Environmental Protection Agency maintains that there are 6% VCM losses from PVC plants and concentrations of 1-2 ppm. in air outside plants. Several PVC makers have been installing ventilation systems as protection for workers. Closing this outlet for air pollution reasons will prove an added hardship for the already-hard-pressed makers of VCM and PVC.

And if limits are put on the amount of unreacted VCM on PVC resins, as is being considered by EPA, the industry may find it has "nowhere to go," as one company spokesman put it.

Dart takes the plunge

Improved market conditions have triggered one polypropylene expansion, and more may be in the works.

Dart Industries, which had been considering expansion for some time (*CW*, Apr. 11, '73, p. 15), said last week it will build a 150-million-lbs./year polypropylene plant near Houston in a joint venture with El Paso Products, a subsidiary of El Paso Natural Gas. Startup is expected in '76; cost was not disclosed.

The partnership already operates a

130-million-lbs./year polypropylene plant in Odessa, Tex. That unit will be debottlenecked to up capacity by 10 million lbs./year, according to Dart's chemical group president, Ralph M. Knight.

Knight said the decision to build a new plant was based on forecasts that U.S. polypropylene demand will double, to about 6 billion lbs./year, by '80. Recent increases in prices of the material, he adds, should offset higher costs.

Site for the new plant will be 550 acres in Bayport, Tex., recently acquired by the partnership from Friendswood Development. Knight said the site was chosen because it is close to other petrochemical complexes and to shipping facilities.

Polypropylene is tight, although not as scarce as some other resins. Prices are firm, and industry observers say additional capacity is needed, since only Hercules and Amoco Chemicals have major U.S. expansions now in the works.

Shortages won't vanish

Shortages of vital feedstocks will be a major and long-lasting problem for the plastics industry, Amoco Chemicals' environmental coordinator, Victor A. Denslow, said last week at the annual technical conference of the Society of Plastics Engineers in San Francisco. The shortages, he predicted, will last at least three years, perhaps 10.

Denslow maintains that new feedstock capacity has been discouraged by low rates of return on investment ("3-5% in recent years, sometimes almost zero").

In addition, he says, environmental considerations have limited the availability of energy and feedstocks. He cites these examples: nuclear plants, which could free hydrocarbons for chemical use, have been held up; the Alaska pipeline has also been delayed; Santa Barbara channel oil has not been available; and sulfur and strip-mining restrictions have cut the availability of coal.

All these factors, Denslow notes, will result in reduced availability of plastics and higher prices. "We can't yet assess the effect of higher prices on demand for plastics," he adds, but he says that it will probably lead to a drop in demand.

Conference leader John J. Maher, general sales manager for Borg-Warner Chemicals, emphasized that "the plastics industry must prove to the oil companies that plastics represent a favorable return on investment to their refineries."

To get a share of available crude oil, he added, plastic producers will have to pay much higher prices.

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