

VINYL PLASTICS

A World View of the
Industry and Market

R. A. MCCARTHY

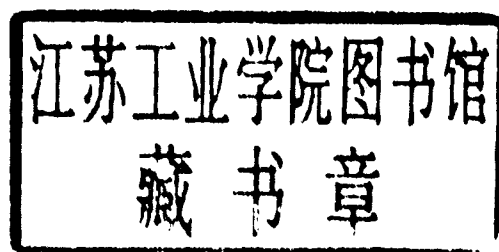
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A World View of the Industry and Market

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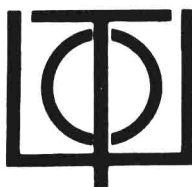
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Executive Summary

U.S. FORECAST

An analysis was made of the U.S. market for PVC using two separate and distinct methods. One method used industrial market research methods by which a projection for the future is made from historical base data plus input from field interviews. The other method used trend analysis of (1) the rate of penetration by PVC into a defined market segment and (2) the level of economic activity in the market being penetrated.

Both the market research method and the trend analysis method gave roughly similar results. However, the 1990 projection for PVC sales was 8.3 billion lbs. by the market research method and 7.8 billion lbs. by the trend analysis. The trend analysis is based on a forecast of New Construction Expenditures growing at one-half the rate of the GNP. The market research reflects the optimism that the economic recovery from the conditions of the early 1980s would take less time than most economists predicted. However, long term, rising imports and less funding of projects by the U.S. government will have a dampening effect on growth. The 4.7%/yr. domestic demand 1980-1985 should slow to 4.3%/yr. 1985-1990. A weakening of the strength of the U.S. currency and a reduction in foreign overcapacity could change these predictions.

A consolidated analysis for the U.S. PVC market, by selected market segments for 1980, 1985 and 1990, together with estimated growth rates is shown in Table I.

SALIENT POINTS

1. PVC domestic demand will increase from 5.32 billion lbs. in 1980 to 6.69 billion lbs. in 1985 and 8.29 billion lbs. in 1990. Imports are expected to increase and exports will decrease. The overcapacity in the industry will keep selling prices and profit margins depressed for most of the 1980s.

TABLE I

Market Research Summary
U.S. Polyvinyl Chloride and Copolymers Projections

	1980*		1985		1990		Compound Growth Rates		
	MM Lbs.	KMT	MM Lbs.	KMT	MM Lbs.	KMT	80-85	85-90	90-95
PIPE & FITTINGS									
Pipe	1921	874	2700	1227	3245	1475	7.0	3.7	5.4
Fittings	103	47	161	73	198	90	9.3	4.2	6.8
Total	2024	921	2861	1300	3443	1565	7.2	3.8	5.4
BUILDING PROFILES									
Siding	210	95	340	155	550	250	10.0	10.0	10.0
Windows	62	28	142	64	252	114	18.0	12.2	15.1
Miscellaneous	67	31	105	48	170	77	9.4	10.1	9.8
Total	339	154	587	267	972	441	11.4	10.3	11.1
WIRE AND CABLE									
	410	186	422	192	445	202	0.6	1.1	1.6
FLOORING									
Copolymer	130	59	162	74	185	84	4.5	2.7	3.6
Plastisol	121	55	161	73	210	96	5.9	5.5	5.7
Total	251	114	323	147	395	180	5.2	4.1	4.6
FILM AND SHEET									
Unsupported	419	191	572	260	700	318	6.4	4.1	5.2
Supported	315	143	298	135	322	146	-1.0	1.5	0.2
Rigid	273	124	358	163	509	232	5.5	7.3	6.4
Total	1007	458	1228	558	1531	696	4.0	4.5	4.2
BOTTLES									
	99	45	240	109	385	175	19.4	10.0	14.6
SOUND RECORDS									
	114	52	70	32	70	32	-9.3	0	-4.8
MISCELLANEOUS									
	611	278	755	343	914	415	4.3	3.9	4.1
EXPORT									
	465	212	205	93	130	58	-15.0	-9.1	-12.0
TOTAL PVC & COPOLYMERS									
	5320	2420	6690	3040	8285	3765	4.7	4.3	4.5

* The historical data base used for the study is a Springborn Laboratories, Inc. data base which relies on historical input from the U.S. International Trade Commission, SPI Committee on Resin Statistics as compiled by Ernst & Whinney, Modern Plastics and the market research that is continually being conducted by Springborn Laboratories, Inc.

2. Ethylene is a petroleum company product and not a part of the upstream supply of most PVC/VCM suppliers. There is an oversupply but increasing demand will cause prices to rise to 23-24¢/lb. in 1985, driving up PVC/VCM prices. Ethylene could be in short supply if new plants are not built in the late 1980s. PVC only uses 13% of present output.
3. Chlorine is made by Formosa Plastics, Occidental and Union Carbide (all PVC suppliers), although 60% of the VCM suppliers are chlorine producers. Chlorine is in oversupply due to the demand for caustic. No supply problems are seen for most of the decade.
4. VCM exports should decline as more overseas capacity is installed and U.S. prices remain high. Capacity should be adequate to the late 1980s since idled capacity can be reactivated. Existing plants operated at 85% of capacity in 1984. Integrated producers should be able to produce VCM more cheaply than non-integrated producers can buy it in the mid-1980s.
5. PVC capacity should be adequate to 1988 with the expansions which have taken place. There is some inefficient capacity that has been taken out of service which could be restarted if necessary.
6. It appears that most of the shake-outs have been completed and that B.F. Goodrich, Borden, CertainTeed, Formosa Plastics, Occidental and Shintech are strong competitors. Vista and Georgia-Gulf should remain assuming some contractual support from the firms from which they were spun off. Smaller firms may have a difficult time and the other larger firms will have to continue to remain committed.
7. Little or no additional bulk solution polymerization capacity will be added in the U.S.
8. PVC copolymers are not a growth area. They represent about 11% of demand. PVC:PVAc is the largest in volume and PVC:PVDC is second.
9. PVC prices increased only 1.2%/yr. 1980-1985 and should increase 5%/yr. 1985-1990. Polyolefin prices should increase slightly faster but remain lower than PVC in ¢/cu.in.
10. New developments in resin morphology will improve processing and new additives for compounds will make better fabricated products. These are evolutionary developments, not revolutionary.
11. 86% of the PVC resin which is compounded is done by the fabricator. 5.5% comes from independent compounders, and 8.5% is sold by resin suppliers. 33% is flexible compound. Compounding is profitable to resin suppliers.
12. About 15% of PVC resin made, exclusive of platisols, sealants, caulks, adhesives, etc. is used captively. Only CertainTeed of the PVC producers could be considered heavily downstream integrated.

13. 2-ethyl hexyl phthalate (DEHP) may be regulated by the EPA, but not all phthalates are expected to be. Lead stabilizers may be approved for potable water use. PVC should regain its food packaging market in film and sheet, but approval for liquor may come too late for PVC to make a major penetration in the 1980s.
14. Although construction is only expected to grow 1.4%/yr. in constant 1972 dollars, over the decade, PVC penetration is expected to be strong. With 60% of PVC resin going to this application area, this is the most important area. The following uses will be affected:

	CGR 1980-1985 %/yr.	CGR 1985-1990 %/yr.	1990 MM lbs.
Siding	10.0	10.0	550
Windows	18.0	12.2	114
Roof membranes	18.0	10.0	51
Flooring	5.2	4.1	395
Wire and cable	0.6	1.1	445
Pipe	7.0	3.7	3443
Fittings	9.3	4.2	198

15. Automotive uses (particularly in sealants) should grow 7.4%/yr. to 1990 to 318 million lbs.
16. Film and sheet accounted for 19% of 1980 PVC demand and rigid PVC was 27% of the 1,007 million lbs. total. 63% of the film and sheet was calendered and 37% extruded. 31% went into packaging including all blown film. Supported sheet is a mature market with only a 0.2%/yr. growth over the decade.

Flexible sheet is also a mature market, but some applications have a good potential for growth such as health and hospital uses, IV blood bags, and roof membranes. Decade growth is seen as 5.2%/yr.

Rigid sheet should grow at 6.4%/yr. rate 1980-1990 with floppy disc jackets and identification cards being the major growth applications.

17. Injection molding, including pipe fittings, should grow at a 4.1%/yr. rate over the decade, but without fittings, at only a 2.7%/yr. rate. Sound records will continue a decline in usage. Blown bottles should grow at a 14.6%/yr. rate over the decade. This could be faster if liquor bottle approval were obtained.
18. Dispersion resins, including flooring wear layer, should have a 4.7%/yr. growth over the decade. Molding will be the fastest growing portion.
19. Canada is now an exporter of PVC and aims to be an EDC exporter. They are in a favorable position to supply EDC to Japan and to supply PVC to Western U.S., due to the currency exchange rate and relatively low cost energy.
20. Overcapacity exists in the PVC industry in Western Europe and cheaper imports from Eastern Europe are a problem. Norway appears to be in a good position to

become a major producer due to North Sea oil and cheap hydroelectric power. Export potential to the Middle East will decline when VCM is produced in Saudi Arabia and PVC is produced in Egypt.

21. South and Central America will be self-sufficient in PVC/VCM. Mexico wants to be an exporter of resin and fabricated PVC products, but neither U.S. or South America needs these. Pricing is high by South American standards.
22. Japan is de-emphasizing raw materials and is developing off-shore sources of cheaper feedstocks. They are also consolidating their PVC producers to regain efficiency. Korea will develop domestically since their exports are expensive. Taiwan will continue to depend on exports and Formosa Plastics is using U.S. produced EDC. The developing countries in the Far East will be markets, but domestic demand is small due to low purchasing power. Indonesia could be a significant factor in the late 1980s since a large domestic market is developing as well as the domestic production of VCM.
23. In 1982, the world supply (capacity to produce) of PVC exceeded world demand by approximately 30%. The estimates for each region are listed in the following table. Market research was conducted in many of these countries; however, secondary sources were used in others.

1982 Estimated World Supply and Demand Balance
of PVC and VCM by Geographical Area

Area	VCM Capacity	PVC Capacity	Balance	Operating PVC Cap. 90% of Total	Demand	Balance
U.S.	4615	4136	479	3722	2680	1042
Canada	434	289	145	260	210	50
W. Europe	7472	5671	1801	5104	3650	1454
E. Europe	3705	3196	509	2876	2290	586
Japan	2381	2014	367	1813	1548	265
Far East	736	1605	(869)	1445	1077	368
Middle East	555	493	62	444	238	206
Latin America	921	740	181	666	685	(19)
South Africa	210	205	5	185	185	0
India	160	209	(49)	188	190	(2)
Australia	<u>230</u>	<u>192</u>	<u>38</u>	<u>173</u>	<u>145</u>	<u>28</u>
Total	21,419	18,750	2,669	16,876	12,898	3,978

U.S. PRODUCERS

The economics of scale demand such large ethylene plants that this type of upstream integration is not feasible for a typical PVC/VCM producer unless he has other needs for ethylene. Shortages which could occur in the later 1980s would be a concern of all.

More PVC/VCM producers make their own chlorine. This is a depressed market since caustic is in demand and chlorine is not. Not being an integrated producer should not be a problem for PVC manufacturers through 1990.

Most of the major PVC suppliers make their own VCM, but there are major VCM merchant suppliers. The PVC maker with VCM can buy chlorine and ethylene more cheaply by volume contracts and produce cheaper VCM than the non-integrated producer can buy it on the open market. This could be a factor if profitability continues to be a problem.

The major capacity additions in 1981 were 310 million lbs. by Shintech, 165 million lbs. by what is now Vista and 250 million lbs. by Tenneco. Formosa Plastic added 530 million lbs. in 1982 and Borden added 300 million lbs.. In 1983 Air Products added 100 million lbs. and Shintech added another 330 million lbs. This brought the active capacity to 8140 million lbs. at the end of 1984 which is 7½% below the active capacity in 1981.

This means that 2145 million lbs. of capacity was shut down in the 1981-1984 period and the 20 PVC suppliers have been reduced to 13 and some of these are under new ownership. The present capacity is almost adequate to meet expected demand in 1990 and if it is not, mothballed plants can be reactivated.

PROCESS AND PRODUCT

An estimated 83% of the PVC made in the U.S. is made by suspension polymerization, 7½% by bulk, 2½% by solution, and 7% by emulsion or microsuspension for dispersion resins. It is doubted that any more bulk or solution processes will be added.

An estimated 89% of the demand for PVC is in homopolymers. Copolymers made with vinyl acetate accounted for 79% of the total copolymers. The second largest copolymer is PVC:PVDC which accounts for 8%. Because of declining markets, growth rates for acetate copolymers were seen to be only 1%/yr. 1980-1985 and 2% 1985-1990. PVC:PVDC copolymer demand growth is believed greater at 5½%/yr. for the decade. Copolymers of PVC:PVAc appear to be losing out to vinyl acetate copolymers.

PVC is perceived to be secure in the markets where it has penetrated and in those that it continues to penetrate. Unless there are changes in the FDA's position towards PVC toxicity, it will not be able to regain lost bottle markets. PVC is expected to regain most of its food packaging markets.

PVC pricing will not change significantly in the decade relative to the polyolefins with which it has some competition. PVC pricing increases of 1.2%/yr. 1979-1985 and 5%/yr. 1985-1990 are forecast. LDPE, HDPE, and PP should increase in price at a slightly faster rate but not enough to overcome PVC's high sp. gr. disadvantage.

There has been considerable development in PVC resins in the past five years in reducing VCM content and increasing kettle size. Since PVC is a mature product, there is considerable product development in resins in order to secure added market share in a competitive market. In the U.S., much work has been done with particulate morphology to improve processing. European developments have been more with additives to improve finished product performance. Both regions have seen considerable equipment development but these developments have been evolutionary.

BUILDING AND CONSTRUCTION

There has been no significant growth in this area, based on constant dollars, in the past 17 years. Residential building demand increased 1.5%/yr. while non-residential declined 0.7%/yr. and public building declined 6%/yr. The forecast is for an overall increase in the 1980s of 1.7%/yr. This will help PVC since 60% of PVC demand is determined by building activity.

Retrofit will grow faster than new building construction requiring siding and windows. The "do-it-yourself" market will grow. Aluminum siding has been the principal retrofit siding material due to favorable cost, proven service life, and marketing strengths of the aluminum companies. Vinyl siding now holds a 20% price advantage and with better distribution, including aluminum companies, market share of PVC has risen to 50% with aluminum in non-wood siding. The future will hold a 10%/yr. growth for PVC siding for the decade.

Growth rates will be enhanced if dark colored PVC with acceptable weathering and heat resistance are developed. The market is available. Projections for PVC siding are 210 million lbs. in 1980, 340 million lbs. in 1985 and 550 million lbs. in 1990.

The demand for maintenance free, thermally efficient windows is increasing the demand for PVC windows. Only 10% of the major window manufacturers use PVC for cladding. Weathershield uses a PVC snap-on and Anderson uses a direct extrusion over wood surfaces. The rest use aluminum.

The all-vinyl window is a relatively new development and a promising growth market. The all-vinyl window can be fabricated in custom sizes and therefore will serve the large retrofit market. Good quality all vinyl windows may be difficult to achieve in this fragmented industry. The projections are for 62 million lbs. of PVC in 1980, 142 million lbs. in 1985, and 252 million lbs. in 1990.

Because of seamless forming on-site, aluminum still holds the gutter and downspout market. PVC must be solvent welded and leaks at joints are a problem. Genova introduced a snap-fit design, reducing labor costs, and a gasket to reduce leaks. Projections are for 43 million lbs. by 1990 in this application from the 1980 level of 5 million lbs. Sales promotion, distribution, and penetration of the professional installer market are needed to accomplish this.

The 1979 floor covering market statistics show resilient flooring taking 23% of the flooring dollar sales with carpeting taking 52% and ceramics 5%. The remaining 20% is accounted for by wood and other systems. Resilient flooring includes sheet vinyl

(dispersion resin on a mat base) and PVC:PVAc copolymer tiles. Vinyl represents 99% of all resilient flooring. Vinyl is found in residential bathrooms and kitchens and in commercial building traffic areas. Vinyl demand in flooring is expected to grow 4.6%/yr. over the decade.

PIPE AND FITTINGS

This application area consumes about 37% of the total PVC demand. The industry has 100 fabricators in 250 fabricating plants. 12 producers account for 50% of the pipe and 6 producers make 50% of the molded fittings. This is an area of aggressive competition both between fabricators and the resin suppliers who service it. Only cost efficient resin suppliers can compete and these are integrated suppliers.

PVC demand in this area grew at a 15%/yr. rate in the 1970s at the expense of other materials. Most code approvals were obtained. This growth is slowing due to the slack building market, the penetration of PVC into most markets where it is cost effective, and the reduction of Federal funds for sewer and rural water systems. The projection is for a 5.4%/yr. growth 1980-1990. Large diameter pipe could be a market bringing faster growth if new developments allow greater penetration by PVC.

WIRE AND CABLE

Growth in PVC demand in this application area has been virtually nil in the 1970s and a 1.6%/yr. growth is predicted for the 1980s. Building wire takes 54% of the PVC used. PVC is losing market share in building wire to nylon insulated wire and because of the increasing use of "tray" wire in non-residential building. This is wire in a metal rectangular trough. Cross-linked PE, thermoplastic elastomers, and PVC/nitrile rubber blends are also used for insulation. The forecast is for 410 million lbs. of PVC in 1980, 422 million lbs. in 1985, and 445 million lbs. in 1990. If chlorinated compounds are banned from public buildings these projections may be optimistic but this seems unlikely at this time.

AUTOMOTIVE

This area only takes 3½% of the PVC consumed although more was taken in earlier years when more vinyl roofs and upholstery were used. Car production is expected to increase to 911 million lbs. by the end of the decade as older cars are scrapped and a lower percentage of imports are purchased (25% going to 18% of the total). It is believed vinyl will lose some of its share in crash pads and steering wheels but will grow in sealants and anti-corrosion coatings replacing asphalt. A 7.4%/yr. growth is predicted, increasing the PVC usage from 156 million lbs. in 1980 to 318 million lbs. in 1990.

FILM AND SHEET

This application area takes 19% of the vinyl demand. 63% of the sheet is calendered and 37% is extruded. Extrusion includes blown film. Growth rate for the 1980s is estimated

at 4.2%/yr. The segments of the usage are unsupported flexible (419 million lbs. in 1980 which should grow at a rate of 5.2%/yr. to 700 million lbs. in 1990), supported flexible (315 million lbs. in 1980 growing at 0.7%/yr. to 322 million lbs. in 1990) and rigid (273 million lbs. in 1980 growing at 6.4%/yr. to 509 million lbs. in 1990).

Flexible PVC is a mature product. Faster growth segments in the late 1980s are hospital and health applications (8%/yr), IV and blood bags (8%/yr.) and roof membranes (10%/yr.). Rigid PVC sheet should have strong growth in medical supply packaging, drug packaging, food packaging, cooling tower trays, and identification cards. Floppy disc jackets for data processing should grow at an estimated 20.5%/yr. rate for the decade.

There is ample capacity to produce film and sheet. Calenders operated at less than 65% capacity in 1981. Imported goods (estimated at 175 million lbs. in 1979) also depressed this industry segment especially in low criteria markets such as shower curtains, window shades, etc. Imported goods may decline as more foreign producers obtain manufacturing facilities in the U.S.

Blown film capacity, on the other hand, is operating close to capacity since a major firm dropped out of the market which used 307 million lbs. in 1984. Food wrap is the largest end-use taking 86% of the total. Growth has stabilized about 4%/yr. Pallet and roll wrap take the remaining 14% of the usage and are growing at a 10%/yr. rate despite competition from EVA:LDPE in roll and pallet wrap and LLDPE in pallet wrap.

INJECTION AND BLOW MOLDING

PVC blow molded bottles had good growth in demand 1965-1973 until FDA concern about PVC's toxicity when used with liquor. This concern appears to have been resolved but the 1.75 liter bottle for liquor which requires a handle is still a future market. Other beverage bottles which do not require handles have gone to PET which is less costly. PVC should hold its share of the cosmetic and cooking oil bottle markets. A 14.6%/yr. growth rate is forecast, without the liquor bottle market.

Phonograph records (compression molded) are a declining usage. Tapes have been taking market share and, recently, video and electronic games have taken funds formerly spent on audio recreation. A decline of 9.3%/yr. is forecast for 1980-1985 and no growth 1985-1990. Molded pipe fittings should have a 6.8%/yr. growth for the decade. The remaining injection molding market in PVC will only be at a 2.7%/yr. growth rate.

DISPERSION RESINS

These resins have historically been an expensive and profitable PVC resin. However, demand has dropped because of the loss of major markets. Sheet flooring demand dropped 35% below 1979 levels in 1980 which caused this type of resin to drop in sales at a greater amount than the 11.5% drop in total PVC demand. Total plastisol in flooring volume in 1980 was 121 million lbs.. Flooring takes 23% of this type of resin and is the largest single usage.

Productive capacity has also dropped due to OSHA regulation on VCM emission to the atmosphere and reduced permissible monomer content in PVC. In 1979, these resins

were on allocation. The flooring market should return to a 5.7%/yr. growth during the decade and coating and molding applications should show a 5%/yr. growth. Applications such as automotive protective coating will grow at a faster rate (12%/yr.) as will adhesive/sealant usage which will average 6%/yr. This will bring overall growth to 4.7%/yr. for the decade. There are seven producers and Goodrich has 1/3 of the market. About 10% of the usage is in PVC:PVAc copolymer.

CANADA

Canada is in a favorable position to produce EDC/VCM since they have natural gas in good supply to provide ethylene and pricing is below world levels. Chlorine is also available. They have increased PVC capacity so that they have gone from an importer of resin to an exporter. Growth in demand for PVC is expected to be 6.4%/yr. 1980-1990. This will mean that new capacity will be needed in 1987.

Canada is counting on exports of both EDC and PVC to bolster their industry. Arrangements have been made to sell EDC to the Far East and they expect to be exporting 100 KT of PVC by 1990. Some of the PVC will come to the U.S. due to the favorable exchange rates between U.S. and Canadian currency, to low cost energy and to an abundant supply of ethylene.

PVC IN WESTERN EUROPE

Western Europe consumed 3486 KT of PVC in 1980 with the countries of Belgium, France, Holland, Italy, United Kingdom, and West Germany accounting for 82% of this. Growth rates for 1980-1985 are estimated at 2.2%/yr. and 1.4%/yr. for 1985-1990. There is more than ample VCM capacity (6017 KT) in these countries as well as ample PVC capacity (4479 KT).

It is expected that there will be a shakeout in PVC producers and this is already happening in France and expected soon in Italy. The United Kingdom has shut down older plants. Norway has a cheap source of electrical power and access to North Sea oil which puts it in a strong position although it is now a small producer. The United Kingdom should be able to keep their new plants in operation. West Germany faces a difficult oversupply problem. Competition from Eastern Europe is a problem to all PVC producers in Western Europe but U.S. imports should be less of a threat as the cost of our imports increase due to energy cost reaching world levels. There are just too many people in the PVC business in Western Europe.

SOUTH AMERICA AND MEXICO

These countries, including Central America, do not seem to be factors in the worldwide PVC/VCM situation. Brazil should continue to supply their own needs in monomer and polymer in the 1980s and Argentina probably will be able to in the later 1980s after they correct current fiscal problems. The other countries are too small to be factors in export-import considerations.

Mexico believes that they can export both PVC and PVC fabricated products to both Brazil and U.S. as well as to South America. It is believed that they will have difficulty

in doing so in both places. PVC is not a labor intensive product and Mexican feedstocks are more costly than in the U.S. Brazil, as well as Venezuela, have good quality PVC and probably can be competitive in price. Mexico is counting heavily on exports in the expansion of their PVC industry but unless they can tie in PVC sales with oil sales, it is believed that they will be unsuccessful.

FAR EAST

The Far East is too diverse to be considered as a whole. Japan is a developed country and the largest factor in the PVC/VCM situation. Malaysia, Thailand, the Philippines and Indonesia are developing countries with a small but growing usage of PVC. Singapore and Hong Kong are cities without enough population to support a PVC industry and are mainly exporting fabricators. South Korea and Taiwan are developed countries with significant production and fabrication facilities.

Japan lacks the basic raw materials for PVC and is trying to correct this problem by arranging for imports of EDC. They have lost much of their export market due to high VCM costs. The industry is being consolidated for greater efficiency. Growth in Japan is estimated at 2.1%/yr. for PVC over the decade.

South Korea and Taiwan also have high VCM costs. In South Korea, growth in PVC will be 5%/yr. over the decade with most going to the domestic market. Taiwan, with half the population, must export and Formosa plastics is trying to make arrangements to secure cheaper VCM. They should have a 7.5%/yr. growth in 1980-1985 and 4.8%/yr. growth in 1985-1990.

The four developing countries will have good PVC demand but it will be small. More production facilities are needed. Indonesia should emerge as the major user of PVC in the latter 1980s. They have a large VCM installation being built in Sumatra which should service all of Southeast Asia. Their controlled economy will concentrate on improving the living standards of the population in the 1980s and a 10%/yr. growth rate for PVC is predicted. The Philippines should see a similar rate but their population is smaller than Indonesia's and they do not have the oil production capabilities. Both countries should require imports of PVC. The amount depends on whether the purchasing power of their populations can be increased and their governments committed to providing basic utilities.

SUMMARY

The world demand for PVC during the 1980s is summarized in the following table. This represents a 4.4% growth over the decade.

The very success of PVC which took market share from other materials of construction has resulted in sharp competition, particularly in the pipe area. Competitors have not only improved their products, but have also waged a propaganda war against PVC. Organizations have been reportedly set up by metal conduit and pipe interests which try to influence legislative and regulatory bodies against plastics in general and PVC in particular. Flammability and evolution of HCl on decomposition have been emphasized

WORLD PVC DEMAND

	1980	1985	1990
USA	2420	3017	3867
Canada	182	265	338
W. Europe	3486	3918	4234
E. Europe	2075	2648	3379 $\frac{1}{2}$
Japan	1570	1512	1933
Far East	910	1366 $\frac{1}{2}$	1899 $\frac{1}{2}$
Middle East	216	275	352
Latin America	579	886	1388 $\frac{1}{2}$
South Africa	160	230	330
India	170	222	290
Australia	<u>125</u>	<u>184</u>	<u>270</u>
Total	11893	14523.5	18281.5

out of proportion to the hazards. The PVC industry is trying to counter this activity, but sales volumes of PVC have undoubtedly been negatively impacted.

Finally, the PVC industry, in common with most of the plastics industry, has not been able to stabilize its supply and demand to achieve a consistent level of profitability. This chronic problem, which underlies all resins of the plastic industry, retards research and development which is needed to improve these energy efficient products which are important to our economy. This, too, is a negative factor in PVC growth.

It is the purpose of this work to show the broad spectrum of usage of PVC and its copolymers worldwide to indicate its importance to the economy of this country and other countries. This is a \$2.5 billion sales industry in 1984 in the U.S. Growth overseas to 1990 is predicted at a 5%/yr. rate which is significant for a 6.5 billion lbs. market. The U.S. market of about the same size is generally predicted to have a 4.5%/yr. growth. Springborn Laboratories, Inc. believes that the economic and competitive problems faced by PVC will slow this growth down during the latter 1980s as export volumes drop with the capacity expansions seen in countries overseas and imports of cheaper PVC fabricated products and resins increase.

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