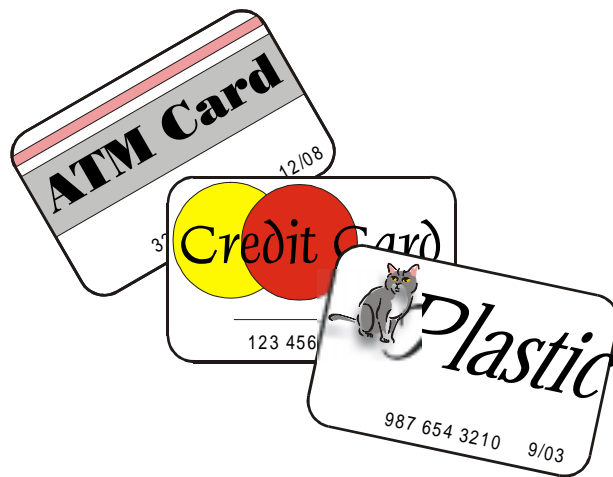


Plastic: PVC (#3)

COMMODITY PROFILE

North Carolina Department of
Environment and Natural Resources
DIVISION OF POLLUTION PREVENTION AND
ENVIRONMENTAL ASSISTANCE

MARKETS ASSESSMENT 1998



OVERVIEW

Polyvinyl chloride (PVC) is used for many industrial, commercial, and household applications. Construction applications include flooring, siding, pipe, wire, and cable. Other applications include appliances, apparel, toys, credit cards, medical supplies, and automotive parts. PVC is also used in films for food wrap and in bottles.

SUPPLY

Current Generation

The Environmental Protection Agency (EPA) has estimated the generation of discarded PVC in municipal and commercial waste streams. Figure 1 presents EPA's generation estimates per product category, along with extrapolated estimates for North Carolina's share of national generation (based on North Carolina's share of the United States population being 2.78 percent). Because significant differences in generation exist from state-to-state, the North Carolina estimates should only be considered to be rough estimates.

Packaging categories from EPA include data that address "other plastic containers," "bags, sacks, and wraps," and "other plastics packaging." Generation estimates for these categories in North Carolina total 10,100 tons.

The American Plastics Council (APC) figures for 1996 indicate the packaging market in the United States comprised 850 million pounds (425,000 tons) of PVC. North Carolina's population based share of the PVC packaging market is 11,800 tons. The APC packaging estimate is slightly higher than EPA's estimate.

Attempting to estimate the generation of PVC in the waste stream based on sales is difficult, because so much PVC is manufactured into durable/semi-permanent items such as vinyl siding and pipes. According to the Vinyl Institute, national sales of PVC as product in 1996 was at 13.3 billion lbs. (6.65 million tons).¹ Of those sales, the North Carolina share prorated at the state's share of population would be 369,740,000 pounds, or 184,870 tons.

Figure 1. PVC Generation in 1996 (tons)

Product Category	Estimated United States Generation	Estimated North Carolina Share
Durable goods	370,000	10,300
Non-durables*	500,000	13,900
Other plastics containers	70,000	2,000
Bags, sacks, and wraps	60,000	1,700
Other plastics packaging**	230,000	6,400
Total Generated PVC	1,230,000	34,300

*Includes plastics in disposable diapers, clothing, footwear, etc.

** Other plastics packaging includes coatings, closures, caps, trays, shapes, etc.

Figure 2. End-Use Manufacturing of PVC in 1996

	United States (Tons)	North Carolina Share (Tons)
Calendering	600,500	16,700
Flooring	114,500	3,200
Textile	39,500	1,100
All other calendering	446,500	12,400
Coating	209,000	5,800
Flooring	112,500	3,100
Textile & paper coating	54,500	1,500
Protective coatings	30,500	800
Adhesives & all other coatings	11,500	300
Extrusion	4,002,000	111,300
Wire & cable	223,500	6,200
Film & sheet	173,500	4,800
Rigid pipe and tubing	2,236,500	62,200
Siding	873,500	24,300
All other extrusions (including windows & doors)	495,000	13,800
Molding	272,000	7,600
Bottles	75,000	2,100
Fittings	141,000	3,900
All other molding	56,000	1,600
Paste Processes	104,500	2,900
Plastisol formulation	61,500	1,700
All other paste processes	43,000	1,200
Resellers and Compounders	288,500	8,000
All other uses	81,000	2,300
Total	5,557,500	154,500

Source: Society of the Plastics Industry, "Selected End-Use," *Facts and Figures of the U.S. Plastics Industry*, p. 83. Data are converted to tons from millions of pounds in the original. Numbers in subcategory might not add to number in total category due to rounding.

Figures from the Society of the Plastics Industry (SPI) on domestic consumption of PVC by end-use are found in Figure 2. One durable PVC product worth noting is extrusion siding. Unlike consumable items that will end up in the waste stream, only a certain fraction of material produced will end up as waste. Vinyl siding from construction (including mobile home construction) is beginning to be recovered in North Carolina and the recovery could increase significantly in coming years.

Future Generation

Future generation often can be predicted by looking at the growth in manufacturing use of PVC. PVC's use in non-durables including bottles has been decreasing while its use in some durable items, such as vinyl siding, has been increasing. This is evidenced by SPI data in Figure 3.

Figure 3. PVC Growth by End-Use (virgin and recycled)

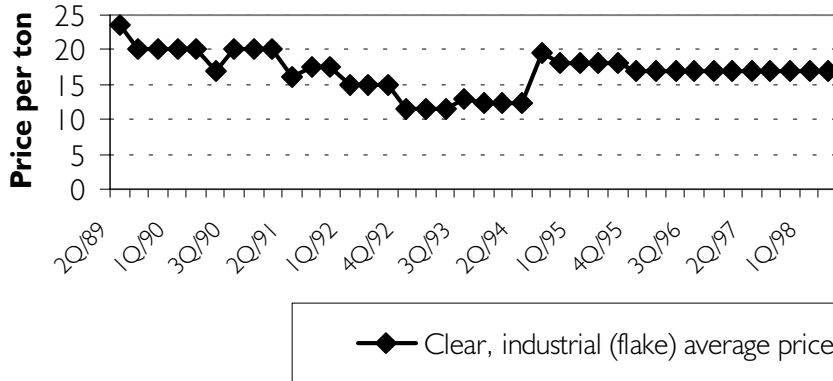
Year	Siding		Bottles	
	millions of pounds	percent increase	millions of pounds	percent increase
1992	971		191	
1993	1180	21.5	178	-6.8
1994	1471	24.7	190	6.7
1995	1440	-2.1	171	-10.0
1996	1747	21.3	150	-12.3

Source: Society of the Plastics Industry, "Domestic Consumption by End-Use," *Facts and Figures of the U.S. Plastics Industry*, p. 83. Data are converted to tons from millions of pounds in the original.

Figure 4. PVC Future Generation (tons)

Estimated 1996 North Carolina Generation	Assumed Annual Growth Rate	Estimated 2002 North Carolina Generation
34,300	5.6% ³	47,600

Figure 5. PVC Price History



Modern Plastics reports the growth in use of PVC in specific end-use markets. Growth in siding markets from 1996 to 1997 was 6.3 percent while PVC use in bottles decreased by one percent in the same period. SPI reports a growth of 5.6 percent in overall PVC sales and captive use between 1996 and 1997.² Figure 4 projects the 1996 generation figures of PVC packaging to 2002, based on the estimated North Carolina share from Figure 1.

Recovery

APC reported a recycling rate of 0.9 percent for PVC packaging and two percent for PVC bottles in 1996.⁴ EPA reports only negligible recovery of PVC in "durable goods," "other plastic containers," and "other plastics packaging" and no recovery in other categories.

A survey of private sector recyclers of PVC yielded little data, but did document recovery of 1,648 tons by two major PVC processors in state. About 500 million pounds of post-industrial vinyl are recovered nationally each year.⁵

MARKET DYNAMICS: PRICES AND CAPACITY

The two major components of market dynamics are prices and capacity. The relationship of these two factors to market dynamics for plastics overall is described in the introductory section to this chapter.

Prices

Prices for recovered PVC have remained steady and should continue to do so through 1998.⁶ Figure 5 illustrates the steadiness in the price paid for recovered PVC since 1995.

DEMAND

According to some sources, demand for recycled PVC resin is expected to increase substantially in the future but remain at relatively low levels compared to other resins and to generated supply. The Freedomia Group, in a report entitled *Plastic Recycling to 2000*, provides the estimates listed in Figure 6.

Figure 6. Demand for Recycled PVC to 2005 (tons converted from lbs. in original)⁷

	1985	1989	1995	2000	2005
Recycled PVC demand	NA	1,500	5,500	12,500	25,000
Percentage growth rate from previous listed year	NA	NA	266%	127%	100%
Overall virgin plastic demand	22,100,000	26,900,000	35,550,000	41,800,000	48,300,000
Recycled PVC as a percentage comparison with virgin plastic demand	NA	.006%	.016%	.03%	.05%

Figure 7. North Carolina-Generated PVC as a Portion of Overall Recycled PVC Demand (tons)

	1996	2002
Estimated North Carolina generated tons	34,300	47,600
Freedonia demand estimate*	6,900	17,500
North Carolina generated tons as a percentage of projected overall demand	497%	272%

*Numbers for Freedonia interpolated to match years for generated estimates.

Other sources document a dismal overall picture of current recycled PVC market demand. A number of factors combined to cut consumption of PVC bottle scrap substantially by the end of 1996.⁸ Markets for PVC bottle scrap in particular appear to be practically non-existent. This is not surprising, because PVC bottles make up only three percent of the bottle market but pose a significant problem for PET bottle recycling.⁹ As little as five to 10 parts per million of PVC is enough to contaminate a load of PET.¹⁰ PVC bottle recyclers likewise consider PET bottles to be contaminants to their material. Because of the much greater amount of PET bottles recovered, materials recovery facilities focus on keeping PVC out of the PET, not recovering the PVC.

Vinyl siding is at least one bright spot for generated PVC in North Carolina. The state has a number of processors who have aggressively moved to recover PVC from manufactured home industrial facilities and to capture "job site" scrap through public and private drop-off sites.

Figure 7 attempts to characterize the "marketability" of North Carolina generated PVC by comparing Freedonia's demand projections to the estimated supply of PVC in the state. North Carolina's generated PVC would obviously be competing with generated PVC from other states and countries. The lower the percentage of North Carolina tons to total demand, theoretically the better chance North Caro-

lina tons have of being successfully marketed. Factors such as proximity to market and resin price must also be considered when characterizing the marketability of North Carolina generated PVC.

Unlike the bottle grade resins (PET and HDPE), a low recovery rate can be expected for PVC. The estimates of marketability in this chapter have been based on the amount of each resin the waste stream. The true volume of recovered resin will be much less than what is estimated in Figure 7.

CONCLUSION

Because PVC is not common in packaging, efforts to reduce its prevalence in the waste stream must focus elsewhere. The most readily identifiable product to concentrate on is vinyl siding. North Carolina is currently increasing programs to address vinyl siding waste and should continue to pay attention to this waste stream.

RECOMMENDATIONS

The following recommendations are based on the study of generation, recovery and markets for PVC in North Carolina presented in this section.

- The PVC industry should increase efforts to build market capacity and demand for recycled PVC resin. At one of the lowest recovery rates of all com-

mon resins, the PVC recycling infrastructure must be encouraged to mature.

- The state should provide incentives and market development assistance to companies interested in recycling PVC. Manufacturers of products from PVC would welcome the increased availability of high-quality cost-competitive post-consumer PVC for use in manufacturing their products.
- With PVC bottles a major contaminant of recov-

ered PET bottles, the state should consider actions to discourage the use of PVC for bottle stock sold in the state.

- Interested parties (including the state, local governments, generators, processors, and end users) should work to maximize the recovery of vinyl siding to take advantage of apparent strong markets for the material and a growing infrastructure.

¹ "The Vinyl Production Process," Vinyl Institute web page: <http://www.vinylinfo.org/wanttoknow.html>

² Society of the Plastics Industry web page: <http://www.socplas.org/industry/stat3.html>

³ Ibid.

⁴ Toloken, Steve, *Plastics News*, March 2, 1998, p. 24.

⁵ Toloken, Steve, *Plastics News*, April 20, 1998, p. 4.

⁶ Smith, Sarah "Recyclers looking up, despite downside," *Plastics News*, January 19, 1998, p. 10.

⁷ <http://freedoniagroup.com/ppv-scripts/>

⁸ "Plastic Recycling's Problem Children," *Resource Recycling*, October, 1997, pp. 32 – 37.

⁹ Toloken, Steve, *Plastics News*, March 2, 1998, p. 24.

¹⁰ Toloken, Steve, *Plastics News*, April 20, 1998, p. 4.