Monsanto

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CC:

SUBJECT: Adhesives Market Summary

REFERENCE:

TO: Adhesives File

Introduction

There are a dozen companies with adhesives sales in excess of $20M. The top four formulators - Borden, National Starch & Chemical, H. B. Fuller, and DuPont, account for almost one quarter of the formulated adhesive business. There are seventeen adhesive markets and no specific one is expected to show spectacular growth in the next five years. Four markets - primary wood bonding, construction, textiles and packaging - control over 80% of the total pounds. Thermoplastic and thermoset systems share over 70% of the volume. Close to 80% of the poundage consists of water based adhesives.

During the next five years, no major changes are foreseen. However, there are several developments in their infancy today, which could command large volumes in the 1980's. Two of these are hot melt pressure sensitive adhesives, and tire sealants.

Government activities which have impacted the industry are Rule 66 (initiated in LA County) which regulates solvents as air pollutants and CPSC movement to ban solvent based consumer adhesives as fire hazards and toxins. Occupational exposure limits have been set by OSHA for a number of raw materials including VCM. Currently being investigated is the potential for cancer hazard in SBR plants. One effect of these activities will be to further heighten interest in hot melts, high solids and water based adhesives. Radiation (UV) curable systems should also be positively affected.

Recommendations/Conclusions

1. Because most adhesive systems are composed primarily of a resin, solvent (water or organic) and occassionally a tackifier (rosin/hydrocarbon) there does not seem to be much of a business opportunity for new and better synthetic additives.

2. Developments within the industry which could command significant (large) markets in the 1980's are:

   a. The shift from hot melts to pressure sensitive hot melts caused by a desire to save fuel costs.

   b. UV pressure sensitive adhesives.

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c. Water based contact cement for the consumer market.

d. UV curable flocking adhesives.

e. Polyurethane latex for textiles, packaging, etc.

f. Development of tire sealant where the ultimate goal in the auto industry would be to eliminate the spare tire.

3. Since thermoplastic and elastomeric systems command the greatest share of the textile/packaging and construction end use markets respectively, the Plasticizers Division should determine whether there are opportunities for polymer additives in this arena.

4. Specifically, Borden, National Starch, H.B. Fuller and DuPont should be contacted to determine if there are needs in this industry which might be met profitably by the Plasticizers Division.

5. It is this author's view, 1-4 notwithstanding, that the effort put into a search for opportunities in the adhesives markets should not be large (∿ 1 man month). The likelihood of finding opportunities for polymer additives in this field seems small upon realization that better performing adhesives are generally a function of changing the resin system through co-polymerization rather than by adding modifiers. This of course is a judgemental statement and can be challenged.

Details

The adhesives industry is fast becoming a mature industry. In 1975 ∿7B lbs. of formulated product (dry basis) worth in excess of $2B was produced. Growth in the industry will be only slightly in excess of the GNP although the dollar value will grow more rapidly due to the trend toward more expensive but faster and better performing materials. Inflation, of course, will also play a major part in dollar growth.

A. Adhesives by Type of Carrier

Water based adhesives have declined slightly to the benefit of 100% solids. Water based systems, however, will still be the dominant factor in the marketplace through 1980.

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Carrier	% of Total Lbs. 1971	1975	1980 (Est.)
Water	82	77	77
Organic	5.5	5.2	4.7
100% Solids	13	17-18	18

Adhesives by Type of Polymer or Base

Thermoplastic and thermosets have grown from 62 to 71% of the market at the expense of natural and miscellaneous (starches, silicated, bituminous, etc.) bases.

Base	% of Total Lbs. 1971	1975	1980 (Est.)
Thermoplastics	31	36	38
Thermosets	31	35	36
Elastomeric	8	7	8
Natural, etc.	30	22	18

B. Consumption of Adhesives by Industry

As with many industries who had big expectations in the early seventies, the adhesive industries projections were for the most part not fulfilled. Carpet backing, plastisol and hot melts apparently are still minor factors while organic body solder remains in the developmental stage. Even structural wood bonding remains below expectations due primarily to a recessed construction industry. Footwear has been negatively impacted by foreign imports however with the U.S. Government's intent to pressure Taiwan and S. Korea into restricting imports to the U.S. this industry could pick up.

The table below shows the consumption of adhesives by industry for 1975 and 1980 (Est.).

Market	$\overline{M}$ Lbs. 1975	$\overline{M}$ lbs. 1980 (Est.)
*Construction	1370	1820
*Primary Wood Bonding	1620	2150
Furniture	89	111
Automotive	221	284
Aircraft/Aerospace	2	3
Electrical/Electronic	16	18
Appliances	6	9
*Packaging	1320	1560
Bookbinding	35	42
*Textiles	1520	2100
Footwear	15	17
Abrasives	44	53
Friction Materials	60	77
Foundary Sand Binders	328	500
Other Product Assembly	34	48

Continued

Market	M̄ Lbs. 1975	M̄ Lbs. 1980 (Est.)
Consumer	52	66
Government Purchases	2	2
Pressure Sensitive	164	225

Adhesives by Type of Polymeric Base

Growth of adhesives by polymeric base will be greatest for specialty products such as cyanoacrylates, anaerobics, furan foundry binders, silicones, butene polymers (for tire sealants), urethanes and acrylics. These seven polymers constituted 3% of the total adhesives in 1975 and are expected to grow overall at 21%/year. By 1980 they will account for 4% of the total market of 9,100M̄ lbs. Interesting the dollar growth will be good but not spectacular since these polymers are already expensive.

A list of adhesives by polymer base follows:

Base	M̄ Lbs. 1975	M̄ Lbs. 1980 (Est.)	*AGR
Polyvinyl Acetate	632	860	6
Polyvinyl Alcohol	75	92	4
Polyvinyl Butyral	36	42	3
Acrylics	86	127	8
Anaerobics	.6	1	17
Cyanoacrylates	.2	.7	28
Polyvinyl Chloride	111	159	7
Polyolefins & EVA	251	353	7
Polyamides	11	15	6
Polyesters & Alkyds	117	136	3
Polyurethanes	19	34	12
Epoxies	59	78	6
Phenolics	1080	1500	7
Amino Resins	913	1155	5
Furan	78	186	19
Natural Rubber	121	105	-3
SBR	1650	2300	7
Reclaim	50	57	3
Neoprene	37	53	7
Nitrile	12	11	-2
Butene Polymers	10	28	23
Silicone	1	3	18
Animal Glue	79	83	1
Starch & Dextrin	947	1146	4
Cellulosics	2	2	0
Bituminous	280	283	0

*AGR = annual growth rate (lbs.)

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C. The adhesive type, key markets and key systems are tabulated below:

Type	Key Market	Key System
Thermoplastic	Textiles, Packaging	Carboxylated SB hot melts, PVAc
Thermoset	Woodbonding	UF, phenol-formaldehyde
Elastomer	Construction	SBR
National	Packaging	Starch
Others	Packaging	Sodium silicate

The adhesives industry consists of 17 markets which consumed a total of 6.9$\bar{B}$ lbs. worth \$2.2$\bar{B}$ in 1975. The overall annual growth rate of these markets as a composite is projected to be 6%/year with the fastest growing segment at 9% (Foundary) and the slowest growing segment at 3% (footwear, packaging, and aircraft). The four largest markets in terms of lbs. volume are primary woodbonding, construction, textiles and packaging.

D. New Developments (1976)

1. Mending and mounting tapes for use at room temperature.
2. Textile interlinings and frisible webs for non-wovens.
3. Cyanoacrylates and anaerobics - one component, moisture curing systems.
4. New methods of curing, ie., U.V., high frequency radiation, electromagnetic bonding.
5. Hot melt pressure sensitive adhesives for tapes and labels.
6. Hot melts for non-packaging uses - copolymers being used to extend performance of resins.
7. Microencapsulated adhesives for easier applications.
8. Catalysts requiring less energy and cure time.
9. Tire sealants.

E. Hot Melts

Since hot melts are expected to be the fastest growing adhesive type from 1976 through 1985, this category will be discussed separately. Hot melts will penetrate the pressure sensitive market and replace solvent based rubber adhesives. They are composed of a polymer or copolymer to

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provide flexibility, a low molecular weight resin (natural or synthetic) for adhesion and a wax extender.

USAGE OF SYNTHETIC HOT MELTS

Resin	Percent
EVA	50
Polyethylene	20
Polypropylene	20
Polyester, Polyamide, Elastomers	10

Advantages	Disadvantages
-non polluting	-Special equipment needed
-no solvent or base	-Tighter controls (melt temp)
-nonflammable	-Must avoid contamination
-indefinite shelf life	-Hazards associated with cloggi
-quick bonding	-Downtime is critical
-no post cure	-more expensive

Major Formulations: Control 70% of market

-DuPont
-Eastman Chemical
-Hercules

MAJOR END USE

End Use	Percent
Packaging	60
Bookbinding	9
Product Assembly	9
Textiles	4
Footwear	3
Other	15

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