

RAW MATERIAL TRENDS FOR HOT MELT ADHESIVES IN EUROPE

Robert W. Smith

Director, New Business Development

Dr. William E. Broxterman

Chairman and CEO

The ChemQuest Group, Inc.

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Introduction

The global adhesives industry is highly complex because of its fragmentation, and the European region is no different than the rest of the world. In some respects, the European market is more complex than that of the United States due to the distinct differences between various countries or regions in Europe. This regional fragmentation makes the European adhesives market more difficult to study and understand. Many participants and suppliers are active in only one or a small number of individual countries. Few supply to the entire European market.

Because of this regional fragmentation, Europe can not be studied as a single entity. Instead, each country or region must be considered separately. Then, only by adding all the data from each region can the overall industry and its strategic trends come into focus.

The ChemQuest Group has approached the European market in a similar fashion to its analysis of the U.S. market for adhesives, examining End Use Markets, Formulative Technologies, and Raw Materials Categories. As stated earlier, the added dimension of individual countries or regions in Europe must also be considered. Table 1 shows the countries or regions into which ChemQuest has divided the European marketplace.



Table 1
Countries/Regions Studied In Europe

- Germany
- United Kingdom
- France
- Italy
- Spain
- Benelux
- Nordic Countries

ChemQuest conducted separate analysis within each of the seven countries/regions in Western Europe, as noted in Table 1. It is believed these seven countries/regions account for 90% of the total adhesive demand in Western Europe. Furthermore, it is believed that Eastern Europe could account for another 10%, but that is beyond the focus of this presentation

Table 2 shows the sixty-one (61) distinct end use market segments used in the analysis, fitting into seven (7) broad End Use Types.

These 61 market segments were selected to match precisely the market segments used in ChemQuest's analysis of the U.S. adhesives industry and captures the key end use applications for adhesives in general, and hot melt adhesives in particular. By using these identical market segments there is now a common base of information from which comparisons of opportunities can be made between Europe and the U.S.



Today, we are focusing on the Hot Melt Adhesive Market which is defined as one of the seven (7) formulative technologies used to describe the adhesives market overall. In fact, Hot Melts represent a sizable portion of both Pressure Sensitive and Non-Pressure Sensitive formulative technologies as displayed in Table 3.

Table 2
Market Segments Studied In Europe

CONSTRUCTION

Resilient Flooring
Ceramic Tile
Countertop Lamination
Manufactured Housing
Carpet Layment
Flooring Underlayment
Prefinished Panels
Joint Cements
Curtain Walls
Wall Covering
Drywall Lamination
Roofing
Heating, Ventilation, Air
Concrete

TRANSPORTATION

Interior Vehicle Trim
Exterior Vehicle Trim
Vehicle Assembly
Rail
Aircraft & Aerospace
Marine

RIGID BONDING

Shakeproof Fastening
Furniture
Milwork Doors, etc.
Appliances
Housewares
Electronics
Machinery
Supported & Unsupported
Lamination
Sandwich Panels

PACKAGING

Corrugated Board
Carton Side Seam &
Disposables
Bags
Labels/Signs/Decals
Cups
Cigarettes and Filters
Envelopes
Remoistenable Products
Film: Film and Film: Foil
Other Flexible Packaging
Specialty Packaging
Composite Containers and

NON-RIGID BONDING

Fabric Combining
Apparel Laminates
Shoe Sole Attachment
Other Shoe Manufacturing
Sports Equipment
Bookbinding
Rug Backing
Flocking Cements
Air & Liquid Filters

CONSUMER

Do-it-Yourself Products
Model & Hobby Supplies
School & Stationery
Decorative Films

TAPES

Packaging
Electrical/Electronic
General Industrial
Surgical/Medical/First Aid
Masking/Protective
Consumer



Table 3
Formulative Technologies Studied In Europe

*Non-Pressure
 Sensitive Adhesives*

*Pressure Sensitive
 Adhesives*

Solvent Borne
 Water Borne
 Hot Melt
 Radiation Curable
 Powder
 1-Part Non-Volatile
 2-Part Systems

Solvent Borne
 Water Borne
 Hot Melt
 Radiation Curable
 Calendered

To adequately understand the raw material trends for hot melt adhesives in Europe, one must first look at the overall structure and trends of the adhesives industry as a whole in this region of the world. While our discussion here will ultimately focus on Hot Melt Adhesives, it is important to recognize the importance of potential shifts between formulative technologies often occur in dynamic markets and specific end use applications. Such shifts often create significant development opportunities in the growth technologies (such as hot melts), and “*profit sinks*” in those technologies experiencing declines (solvent borne).

Finally, and perhaps most importantly for our topic, the choice of raw materials used in a given formulative technology often provides the basis for choosing one formulative technology over another. Conversely, the demand for a given raw material can be affected by any of the macro trends impacting on one technology versus another.



Therefore, any comprehensive study of the industry must necessarily include an understanding of the key strategic trends causing a shift from one raw material to another. Since there are hundreds of different raw materials that find use in adhesives, and specifically in hot melt adhesives, we have force fit these raw materials into forty-one (41) categories, as noted in Table 4.

Table 4
Raw Material Categories Studied In Europe

Acrylics	Hydrocarbon Resins	Reclaim Rubber
Acrylic-Vinyl Acetate Copolymers	Natural Rubbers	Rosin and Rosin Esters
Aminoplasts	Neoprenes	SBR (Random Styrene Butadiene)
Anaerobics	Nitrile Rubber (NBR)	Silicone
Animal/Fish	Other Vinyls	Sodium Silicate
Bitumen	Phenolics	Starches and Dextrines
Block Copolymers	Plasticizers	Structural Acrylics
Butyl Rubbers	Polyamides	Terpene Resins
Casein	Polyester-Thermoplastic	Urethane-Thermoplastic
Cellulosics	Polyester-Thermosetting	Urethane-Thermosetting
Cyanoacrylates	Polyethylene	VAE (50+% Vinyl Acetate)
Epoxies	Polyisobutylene	Other Polymers
EVA Copolymers (50+% Ethylene)	Polypropylene	Fillers
	Polyvinyl Chloride (PVC)	
	PVA (Vinyl Acetate Homopolymers)	

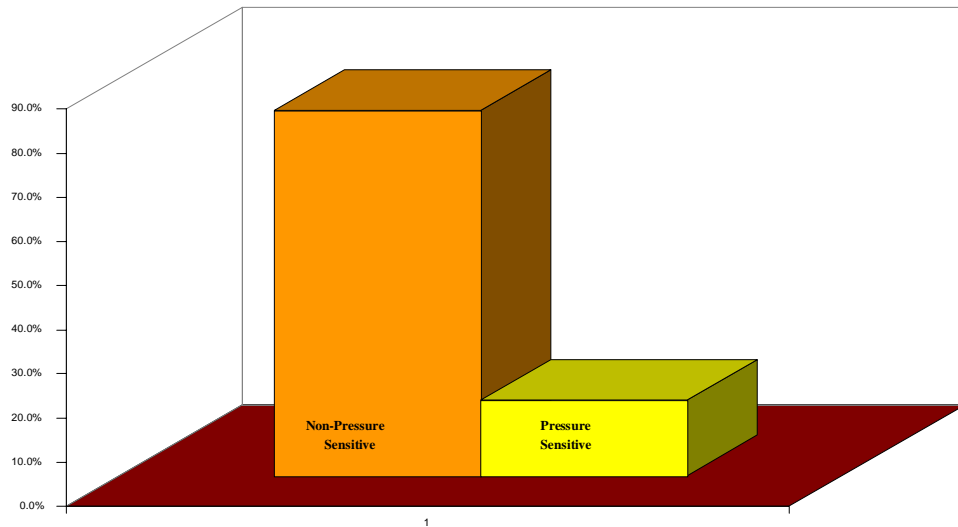
Clearly, not all categories of raw materials are relevant to hot melt adhesives. These will be covered in detail later.



The Adhesives Industry in Western Europe

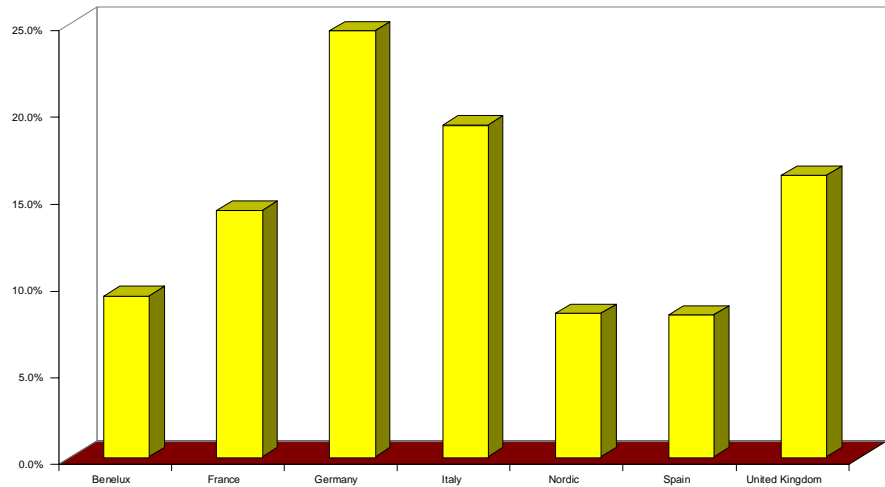
The European market is dominated by Non-Pressure Sensitive Adhesives. In fact, the demand for non-pressure sensitive varieties is almost five times that of pressure sensitive adhesives. However, many non-pressure sensitive adhesive applications have reached maturity, whereas more pressure sensitive applications are still in the growth phase. Figure 1 shows the overall European demand for pressure sensitive versus non-pressure sensitive adhesives in total. Overall, the total adhesive demand in Western Europe totaled 2.15 Billion dry metric tons in 1998, with an aggregate value of 8.4 Billion Euros. It is expected to grow at an annual rate of approximately 2.5% per year over the next 5 to 10 years, which is in line with the expected growth of European GDP over the same period of time.

Figure 1
European Adhesive Demand
-- Non-Pressure vs Pressure --



As noted earlier, the European market is characterized by distinctions within specific countries and regions. Figure 2 presents this breakdown in volume by country / region for the overall European adhesives industry.

Figure 2
European Adhesive Demand
-- By Country/Region -

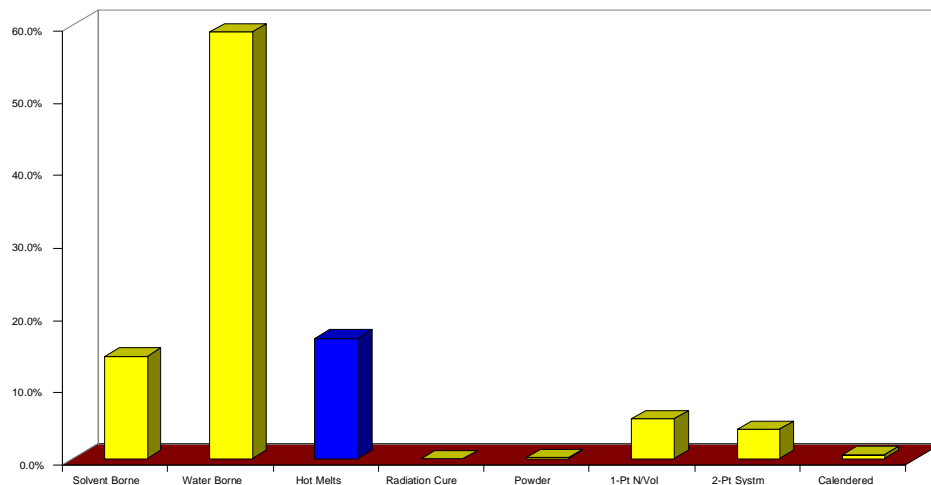


Clearly, Germany represents the largest overall demand for adhesives in Europe. Collectively, Germany, France, Italy, and the U.K. account for almost 75% of total adhesive demand. Growth from 1998 through 2008 is expected to be quite uniform across Europe, but the Nordic countries, Spain, and the U.K. are expected to enjoy a slightly higher overall growth rates.

Hot Melt Adhesives represent almost 17% of total European adhesive demand, as can be seen in Figure 3. Non-pressure sensitive applications account for a bit over 80% of total hot melt demand, although pressure sensitive end uses are growing at a slightly faster rate.



Figure 3
European Adhesive Demand
-- By Formulative Technology --



However, in some market segments, hot melt adhesives are either a smaller or larger portion of the overall adhesives market. While overall, hot melt adhesives represent a very small portion of the demand in Construction, they command an increasing share of total adhesive demand in Consumer, Transportation, Non-rigid bonding, Tapes, Packaging, and Rigid Bonding end use market segments as seen in Figures 4-10.



Figure 4
Formulative Technology Demand
-- In The Construction Sector --

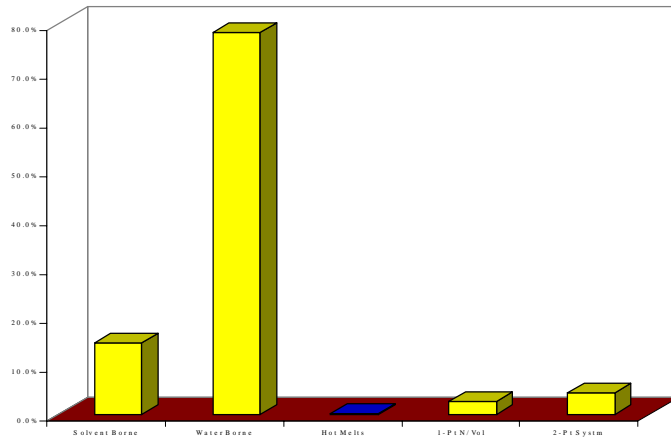


Figure 5
Formulative Technology Demand
-- In The Transportation Sector --

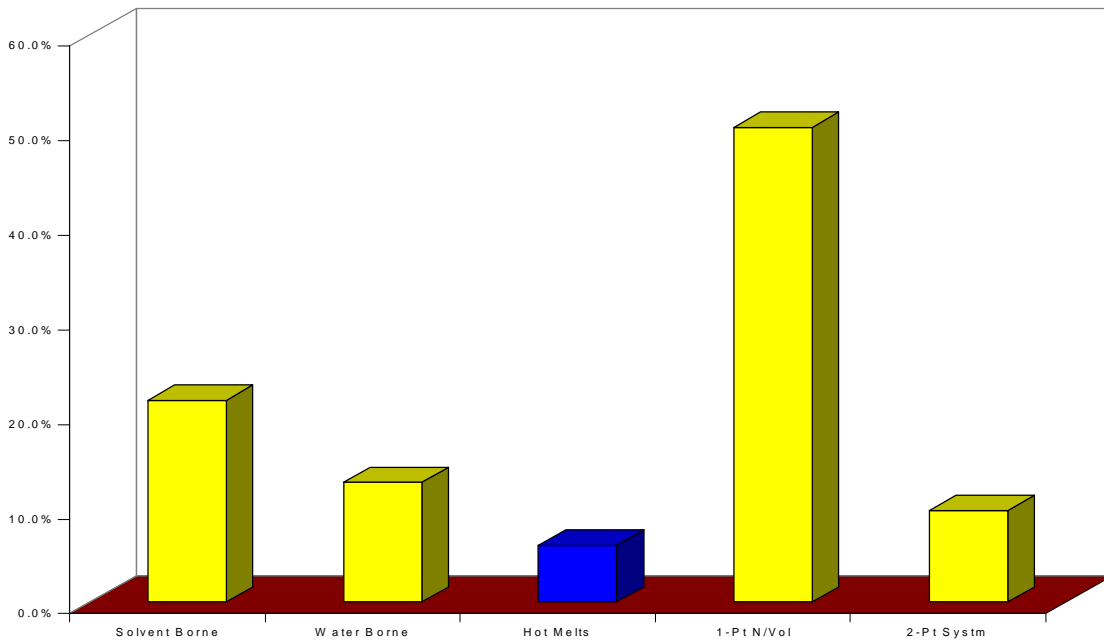


Figure 6
Formulative Technology Demand
-- In The Rigid Bonding Sector --

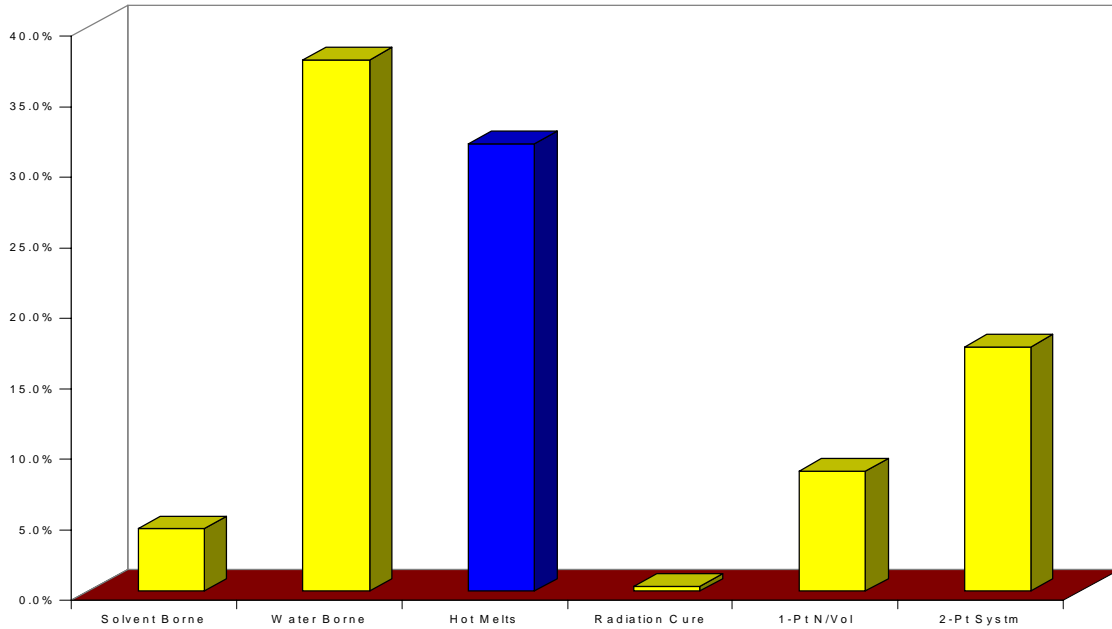


Figure 7
Formulative Technology Demand
 -- In The Packaging Sector --

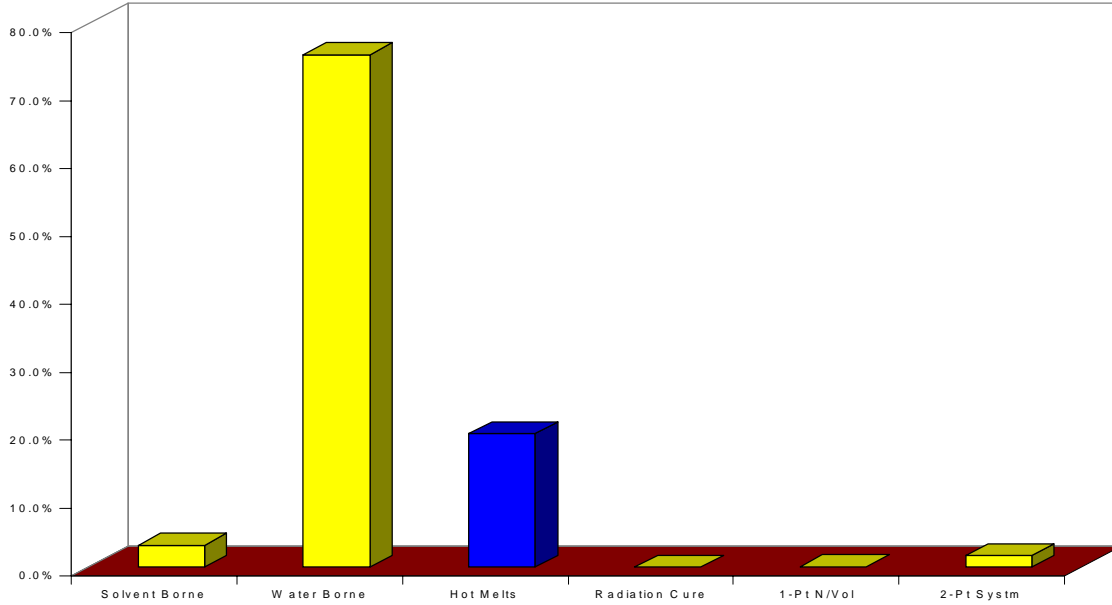


Figure 8
Formulative Technology Demand
 -- In The Non-Rigid Bonding Sector --

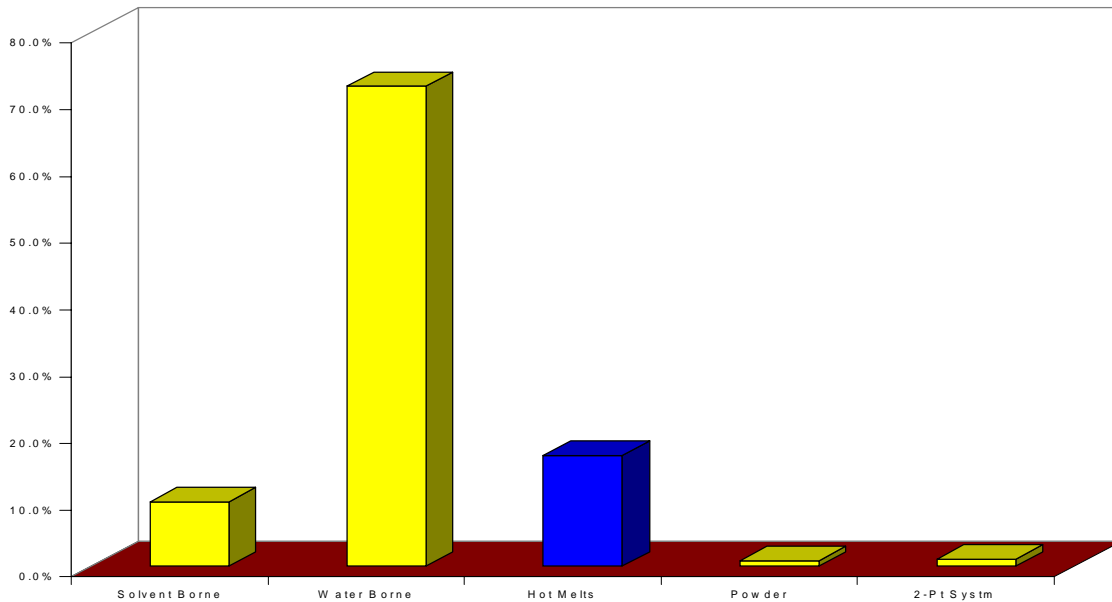


Figure 9
Formulative Technology Demand
-- In The Consumer Sector --

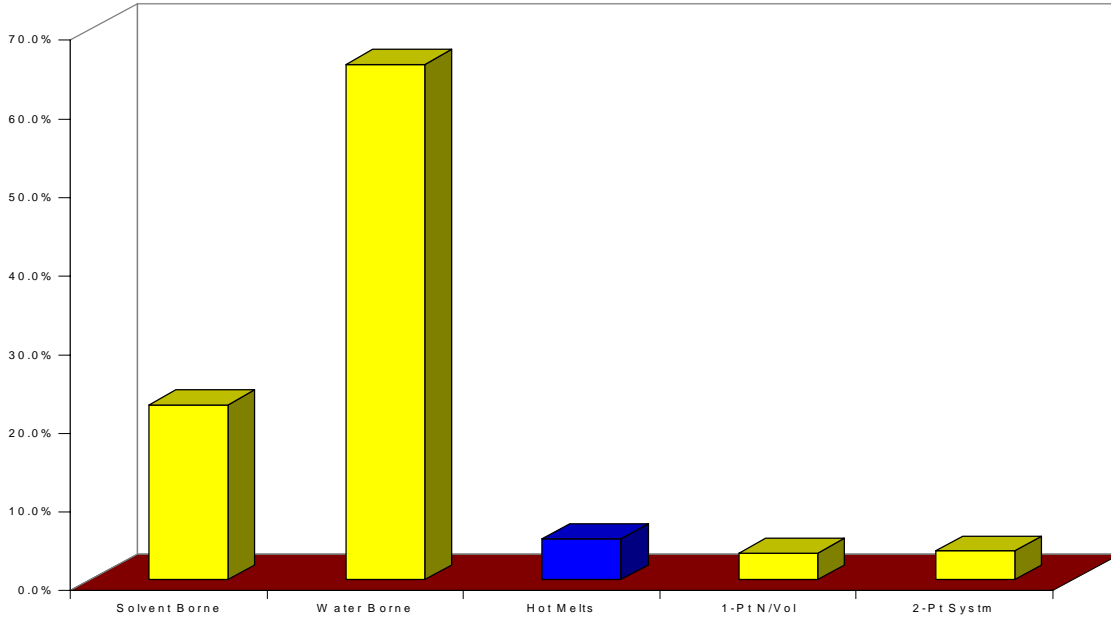
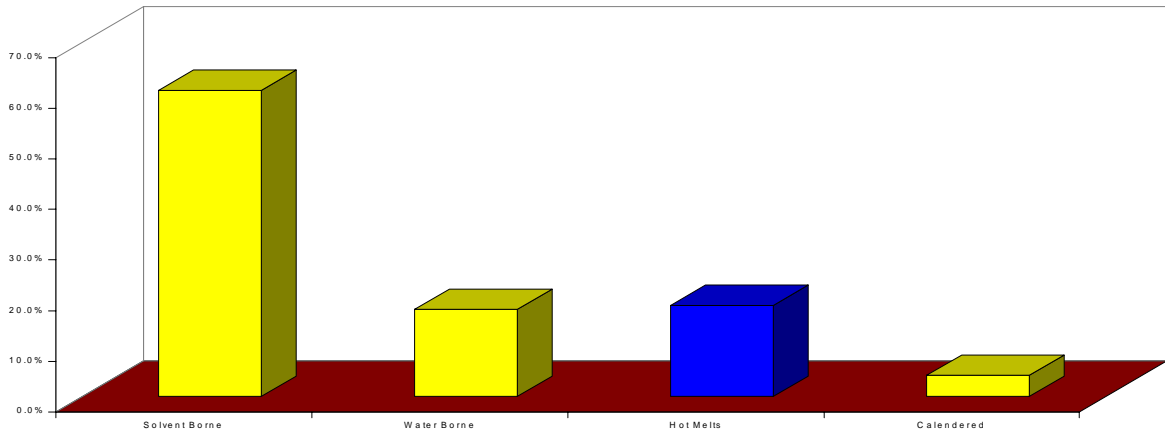


Figure 10
Formulative Technology Demand
-- In The Tape Sector --

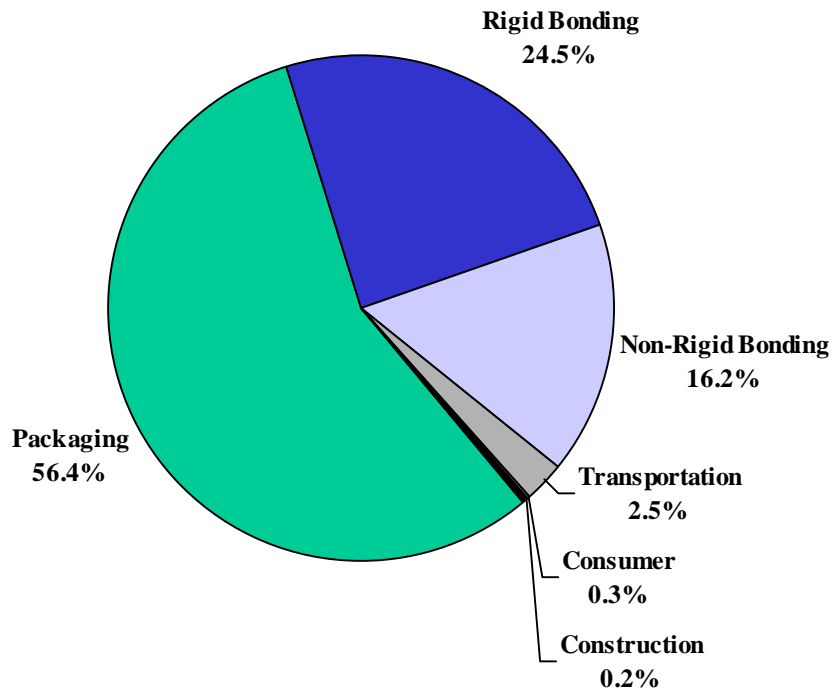


Hot Melt Adhesives are an important part of the Western European adhesives industry, and impact a broad base of overall industrial output.

End Use Market Sectors

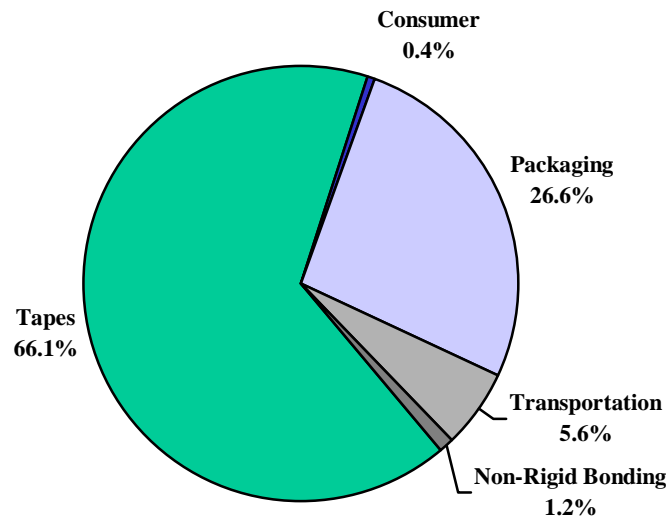
Hot melt adhesives find application in a number of key market sectors. Due to the fundamental differences in the properties between Pressure Sensitive and Non Pressure Sensitive Hot Melt adhesives, it is best to look at each as a distinctive group.

Figure 11
Non-Pressure Sensitive Hot Melt Adhesives – Market Sector Consumption
1998 Volume



Packaging applications dominate Non-Pressure Sensitive adhesive use in Western Europe representing over 56% of the Non-Pressure Sensitive Volume in 1998, although growth in that Market Sector is expected to be 1.7% annually through 2003. Major end use markets in packaging include case and carton sealing. Although small, consumer consumption is expected to grow at over 5.5% in the forecast period. Non-transportation related Rigid Bonding represents over 16% of the volume and is expected to grow at a healthy 3.5% annually. A major end use market is furniture manufacturing.

Figure 12
Pressure Sensitive Hot Melt Adhesives – Market Sector Consumption
1998 Volume



Tape & Label construction dominates Pressure Sensitive hot melt consumption in Western Europe commanding over 66% of the total volume with an anticipated growth rate of 6.7% annually through 2003. Packaging represents the second largest market sector for Pressure Sensitive hot melt adhesives in the region consuming over 26% of the volume and growing at a slightly lower rate of 5.6% annually.



Key Raw Material Trends

Getting back to our major focus on raw material trends, the overall trends in hot melt adhesive raw materials certainly follow that of this class of adhesive. There are some significant differences in the raw materials used to formulate pressure sensitive hot melt adhesives versus non-pressure sensitive hot melt adhesives. Although the latter group is more important from a volume perspective, the pressure sensitive varieties are growing at a significantly faster pace. The key raw materials for Non-Pressure Sensitive Hot Melt Adhesives are summarized in Table 5.

Table 5
Key Raw Materials for Non-Pressure Sensitive
Hot Melt Adhesives in Western Europe

	1998 – 2003 % AGR	1998 Volume (thousand dry metric tons)
Tackifying Resins	2.1%	118
Olefin-based Polymers	2.4%	87
High Performance Polymers	2.7%	20
Block Co-Polymers	2.6%	17
Other Polymers & Additives	2.3%	44
Total	2.4%	286

(Note: Olefin-based polymers included EVA, Polyethylene and Polypropylene polymers. High Performance Polymers include Polyamide, Polyurethane and Polyester polymers.)

Packaging applications dominate the consumption of non-pressure sensitive hot melt adhesives, and as you can see from the above, EVA and polyolefins are the most important base polymers used. The continued need to provide packaging hot



melt adhesives that run cleanly and offer resistance to char should help accelerate the demand for polyolefin based raw materials. As might be expected, tackifying resins represent the largest single class of raw materials consumed in these adhesives. No major changes are anticipated in the overall mix of raw materials. Choice of tackifying resin will continue to depend upon both technology requirements and economics of the various natural product-based and hydrocarbon types.

As mentioned earlier, the raw materials used for Pressure Sensitive Hot Melt Adhesives differ somewhat. Table 6 Summarizes the Raw Material Usage in Western Europe for formulating pressure sensitive hot melt adhesives.

Table 6
Key Raw Materials for Pressure Sensitive
Hot Melt Adhesives in Western Europe

	1998 – 2003 % AGR	1998 Volume (thousand dry metric tons)
Tackifying Resins	6.2%	26
Olefin-based polymers	3.7%	1
Block Co-Polymers	6.4%	27
Other Polymers & Additives	5.4%	20
Total	6.3%	74

Clearly, pressure sensitive hot melt adhesives, although representing much lower volume currently, are expected to grow at a much faster rate than non-pressure sensitive varieties. It should be noted that ChemQuest considers the elastomeric based hot melt adhesives used for assembling diapers and feminine hygiene products to be non-pressure sensitive varieties, despite the apparent contradiction since most of these adhesives do in fact exhibit room temperature tack. The growth of pressure sensitive hot melt adhesives in Western Europe is predicted to outpace that of non-pressure sensitive varieties by 6.3% to 2.4% annual growth rates through



2003, and perhaps beyond. The primary reason for this more aggressive growth is the market segments in which each type of product is consumed.

There could be important shifts in tackifying resin consumption in the next few years if oil prices continue to escalate and make hydrocarbon based tackifying resins less economically attractive than those based on rosins or other natural sources. Formulators have expended considerable efforts to identify suitable replacement resins whenever possible to hedge against shortages or price instability.

In pressure sensitive hot melt adhesives, styrenic block copolymers will continue to dominate the elastomeric resin category and show very attractive growth rates. There are few suppliers of this important raw material. Some small amounts of acrylic resin are consumed in pressure sensitive hot melt adhesives as a small number of suppliers have developed acrylic resin-based hot melt adhesives, but to date this technology is quite small. Plasticizer consumption, which is included within *Other Polymers & Additives*, will grow slightly faster than the pressure sensitive adhesives as a whole, perhaps the result of continued efforts to reduce cost and to offer lower melt viscosity products to improve end users productivity.



Summary

Hot Melts Adhesives represent a significant component of overall adhesive consumption in Western Europe. Growth is expected to outpace that of the overall adhesives industry in the region as well as overall economic growth. Certain regions within Western Europe account for more consumption than other regions, but the entire Western European market for hot melts bodes well for both formulators and suppliers. End use market drive hot melt adhesive consumption and the large packaging market and the increasing need for pressure sensitive adhesives will continue to drive the hot melt adhesive market forward at attractive growth levels. Increased demand for pressure sensitive products in general as well as continued environmental pressures should continue to drive pressure sensitive hot melt demand globally. It would not be surprising to see continued consolidation of both raw material suppliers and formulators in this industry. One major global supplier of tackifying resins has recently voiced interest in divesting their business in which these products are contained. The past few years have also seen considerable consolidation globally of formulators of hot melt adhesives. This is partially driven by demands of end users to do business on a global basis, purchasing the same products from the same suppliers throughout the world.



Questions or request for additional copies of this paper may be directed to the authors at:

The ChemQuest Group, Inc.
8150 Corporate Park Drive
Suite 250
Cincinnati, OH 45242

(513) 469-7555

(513) 469-7779 - FAX

www.chemquest.com

