

“AU NATURAL...NATURAL BASED ADHESIVES –  
8,000 YEARS AND STILL GOING STRONG”

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Even the ancient Greeks & Romans recognized the utility of naturally occurring materials as adhesives. Both the Greeks and Romans developed early veneer processes using crude glues derived from animal protein. Even ancient myths embraced adhesives as major themes. The mythical winged horse, Icarus, was a victim of the predictable failure of a hot melt adhesive when the beeswax holding his wings together softened as he ventured too close to the sun and his wings fell apart due to adhesive failure.

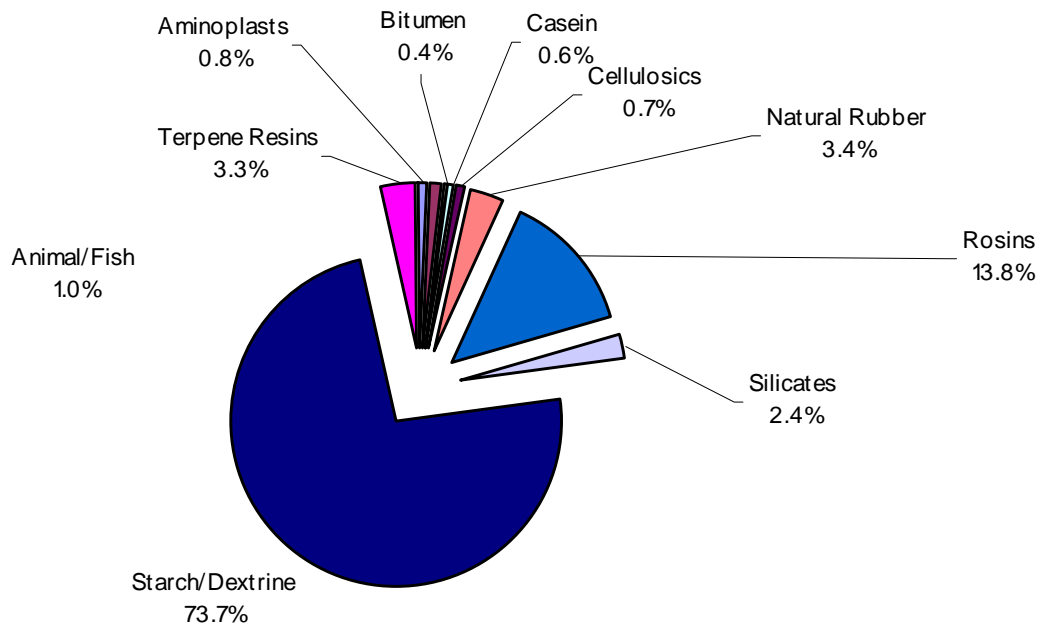
Some of the earliest evidence of early man's recognition of the adhesive powers of natural materials around him were discovered by archeologists near the Dead Sea in what is now Israel in broken pottery shards that seem to have been patched with what is believed to have been tree resins. In Egypt, paintings and drawings found in tombs show what appears to be the use of adhesive materials used in gluing wood objects. Artifacts from Egyptian tombs also reveal objects that appear to have been glued together using animal glues. Other archaeological evidence exists of the use of a number of natural materials as adhesives, including: animal collagen, eggs, blood, tree resins, milk by-products, grains, and even the aforementioned beeswax.

In fact, until the 20<sup>th</sup> Century, natural materials were the predominant basis of almost all adhesives. It wasn't until the advent of synthetic polymer chemistry beginning in the 1930s that natural based adhesives had any real challengers. In the period leading up to World War II, new polymers provided countless new building blocks for the modern adhesives industry.

Despite the development of synthetic based materials and the huge impact upon the adhesive industry, natural raw materials continue to hold an important role in the formulation of adhesives and even continue to dominate in certain industrial segments such as corrugation where starch and dextrin based adhesives reign supreme. In fact, natural based raw materials today represent almost 30% of ALL the raw materials used in formulated adhesives in the U.S. Chart 1 shows the importance of the key natural raw materials consumed in adhesive formulations in the US today. Each key natural raw material is listed as a percentage of the overall US formulated adhesives industry on a dry pound basis for 2004.



## NATURAL BASED RAW MATERIALS IN THE U.S. ADHESIVES INDUSTRY, Dry Pounds



Natural adhesives also find utility in a broad range of end-use market segments, most notably those in woodworking and paper based industries, including corrugating and package manufacturing. For example, starch based adhesives represent a significant portion of the total U.S. adhesives used in such diverse end-use markets as:

1. Corrugating – Starch and dextrin based adhesives dominate the production of corrugated board with about 94% of all the volume of adhesive used in this important material and is expected to continue to show growth in total volume of a little over 3% annually.



2. Bookbinding -- Animal protein based adhesives represent a bit over 10% of the total adhesive consumed in bookbinding applications with an annual growth for such adhesives expected to slightly exceed 4%.

Additionally, many natural based raw materials today find great utility as formulating components in adhesive systems comprised primarily of synthetic materials. Casein finds use in many water-based adhesives used in packaging and the formulation of pressure sensitive adhesives. Despite concerns over allergic reactions among certain percentages of the population, natural rubber remains an important formulating tool for pressure sensitive adhesives used in medical products such as self-adhering bandages and in self-sealing envelope closures. There are few synthetic alternatives that perform to the acceptable standards of these natural materials.

Natural based adhesives continue to play a major role in global manufacturing and retain a significant share of many end-use applications, particularly in paper and woodworking industries. It is anticipated that not only will natural based adhesives continue to grow, but the current level of sophistication in the formulation of adhesives from these naturally occurring raw materials, sometimes even combined with synthetic compounds, will remain a very important part of the adhesives industry on a global basis.



## About the Author



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Bob joined ChemQuest in 1999 with 27 years experience in the Adhesives, Sealants and Coatings Industry. Prior to joining ChemQuest, he served as Business Manager and New Business Development Manager of Ashland Specialty Chemical Polymers & Adhesives Division. He brings with him extensive knowledge and experience in developing high-productivity sales and marketing teams, developing business processes, market assessment, competitive analysis and business modeling. His primary strategic focus has been in catalyzing growth through internal initiatives as well as business and technology acquisition, licensing and partnerships. He holds a B.S. in Chemical Natural & Synthetic Polymer Chemistry from SUNY College of Environmental Science & Forestry. Call Bob at (614) 792-3673 or [rwsmith@chemquest.com](mailto:rwsmith@chemquest.com)

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