



Structural Adhesives

Trends and Driving Forces

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Key Question

What is a structural adhesive?



Structural Adhesive Descriptions / Definitions

- These are really strong adhesives
- They are used to make structures
- They are used to make load-bearing structures with loads exceeding
- They are stronger than the substrates being bonded
- They are Epoxies, Urethanes and Structural Acrylics



Considering Each Of These Further:

- These are really strong adhesives
- They are used to make structures



Considering Each Of These Further:

- They are used to make load-bearing structures with loads exceeding



Considering Each Of These Further:

- They are stronger than the substrates being bonded



Considering Each Of These Further:

- They are Epoxies, Urethanes and Structural Acrylics





A Possible Definition:

A Structural Adhesive is an adhesive that contributes substantially to the structural integrity of the component or product being manufactured.



ChemQuest Adhesive Market Segments

Construction

Resilient Flooring
Ceramic Tile
Counter Tops
Manufactured Housing
Fabricated Beams & Trusses
Carpet Layment
Under Layment
Panel Adhesives
Joint Cements
Curtain Walls
Wall Covering
Dry Wall Adhesives
Roofing Adhesives
HVA/C
Concrete

Transportation

Auto Exterior Trim
Auto Interior Trim
Auto Assembly
Railroad
Aircraft/Aerospace
Marine

Rigid Bonding

Shakeproof Fastening
Furniture
Millwork
Appliance
Houseware
Electronic
Machinery
(Un)Supported Film
Sandwich Panels

Packaging

Corrugated
Cartons
Disposables
Bags
Labels/Signs/Decals
Cups
Cigarettes
Envelops
Remoistenables
Film;Film Laminations
Other Flexible Packaging
Specialty Packaging
Composite Containers

Non-Rigid Bonding

Fabric Combining
Apparel Bonding
Shoe Sole Attachment
Other Shoe Adhesives
Sport Equipment
Bookbinding
Rug Backing
Flocking Cements
Filter Manufacture

Consumer

D - I - Y
Model/Hobby Supplies
School/Stationery Supplies
Decorative Films

Tapes

Packaging Tapes
Electrical Tapes
Industrial Tapes
Surgical/Medical Tapes
Masking Tapes
Consumer Tapes



Packaging Market Segments

Corrugated

Cartons

Disposables

Bags

Labels/Signs/Decals

Cups

Cigarettes

Envelops

Remoistenables

Film:Film Laminations

Other Flexible Packaging

Specialty Packaging

Composite Containers





Proposed Definition for this paper:

A Structural Adhesive is an adhesive that contributes substantially to the structural integrity of a rigid component or rigid product being manufactured.



Market Sectors With Rigid Bonding Applications

Construction

Resilient Flooring
Ceramic Tile
Counter Tops
Manufactured Housing
Fabricated Beams & Trusses
Carpet Layment
Under Layment
Panel Adhesives
Joint Cements
Curtain Walls
Wall Covering
Dry Wall Adhesives
Roofing Adhesives
HVA/C
Concrete

Transportation

Auto Exterior Trim
Auto Interior Trim
Auto Assembly
Railroad
Aircraft/Aerospace
Marine

Rigid Bonding

Shakeproof Fastening
Furniture
Millwork
Appliance
Houseware
Electronic
Machinery
(Un)Supported Film
Sandwich Panels



Structural Adhesives

Market Size & Growth

\$1.8 Billion

655 MM Dry Lbs

AGR of 5.3% / Year



Market Segments With Rigid Bonding Structural Applications

Construction

Resilient Flooring
Ceramic Tile
Counter Tops
Manufactured Housing
Fabricated Beams & Trusses
Carpet Layment
Under Layment
Panel Adhesives
Joint Cements
Curtain Walls
Wall Covering
Dry Wall Adhesives
Roofing Adhesives
HVA/C
Concrete

Transportation

Auto Exterior Trim
Auto Interior Trim
Auto Assembly
Railroad
Aircraft/Aerospace
Marine

Rigid Bonding

Shakeproof Fastening
Furniture
Millwork
Appliance
Houseware
Electronic
Machinery
(Un)Supported Film
Sandwich Panels



Structural Adhesives

Market Segmentation

- **Porous Substrate Bonding**

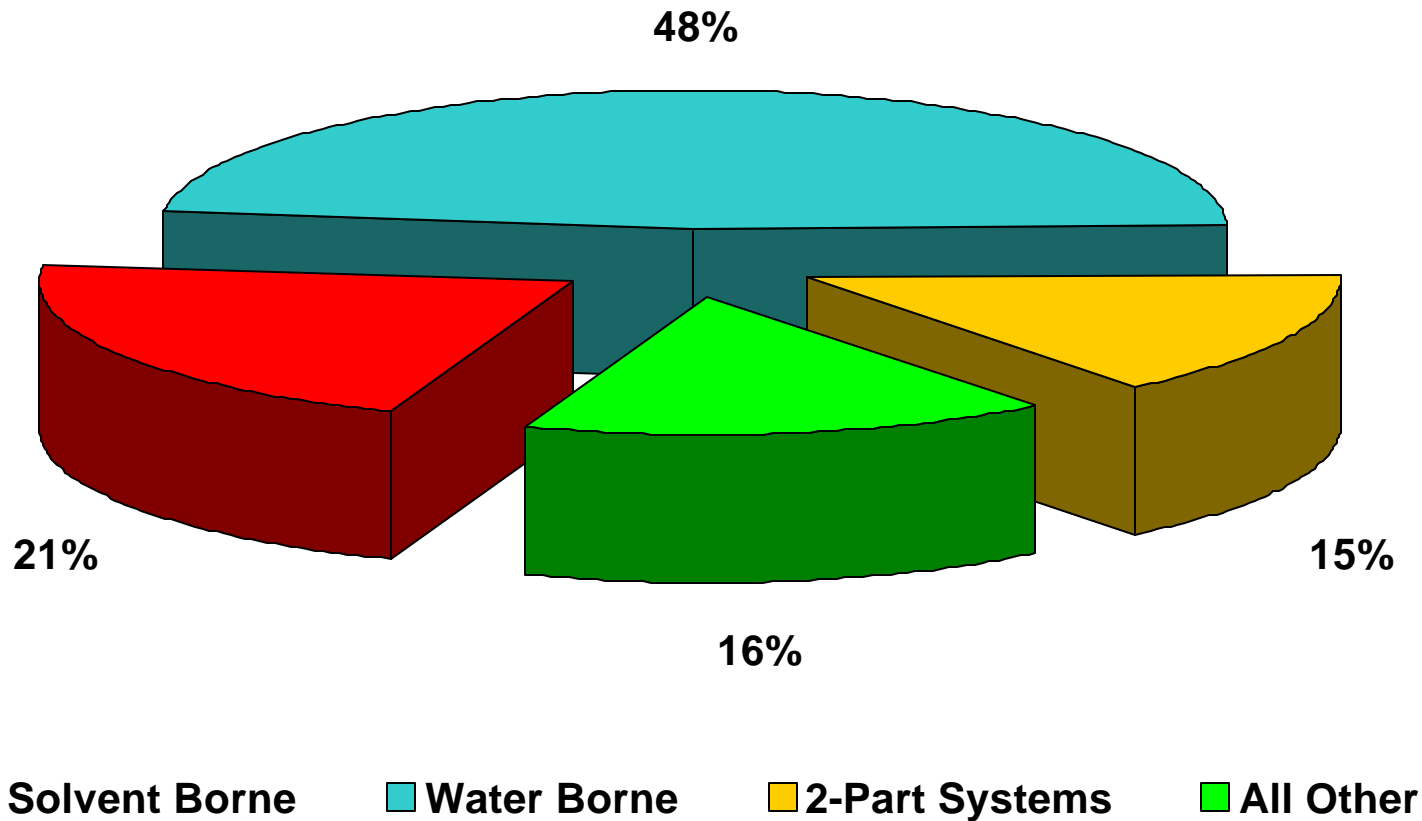
Principally Wood Bonding

- **Non-Porous Substrate Bonding**

Metal, Glass, Plastic

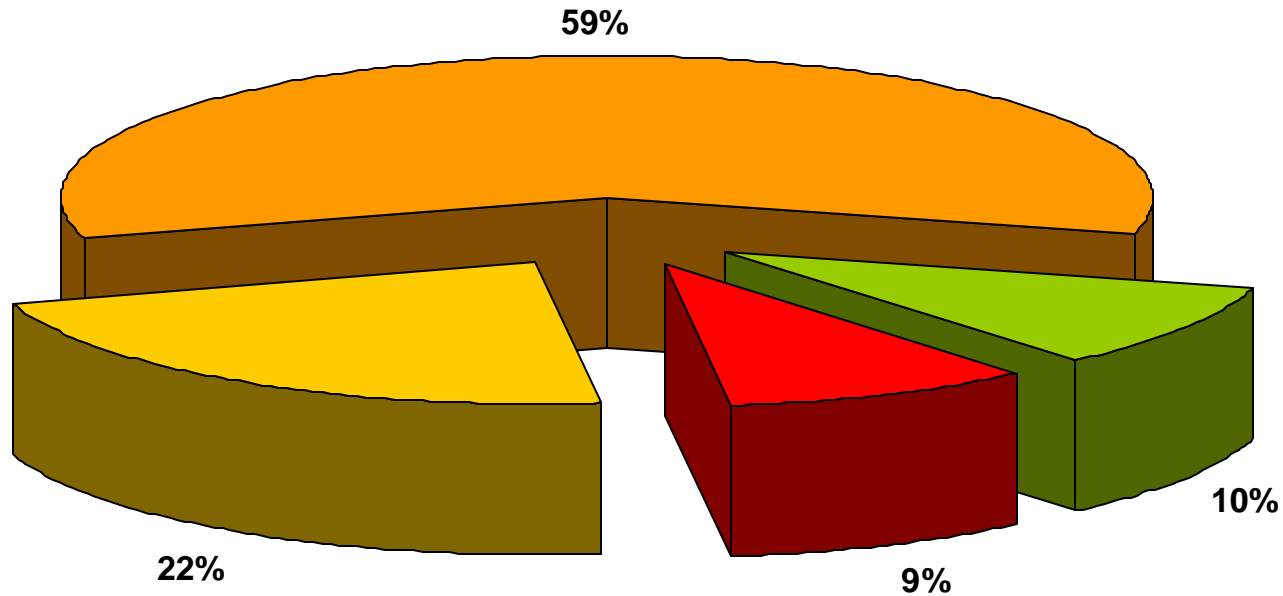


Porous Substrate Bonding Structural Adhesives Formulative Technologies



Porous Substrate Bonding Structural Adhesives

Raw Material Classes



■ Urethane Based ■ Rubber Based ■ Vinyl Acetate Based ■ All Other

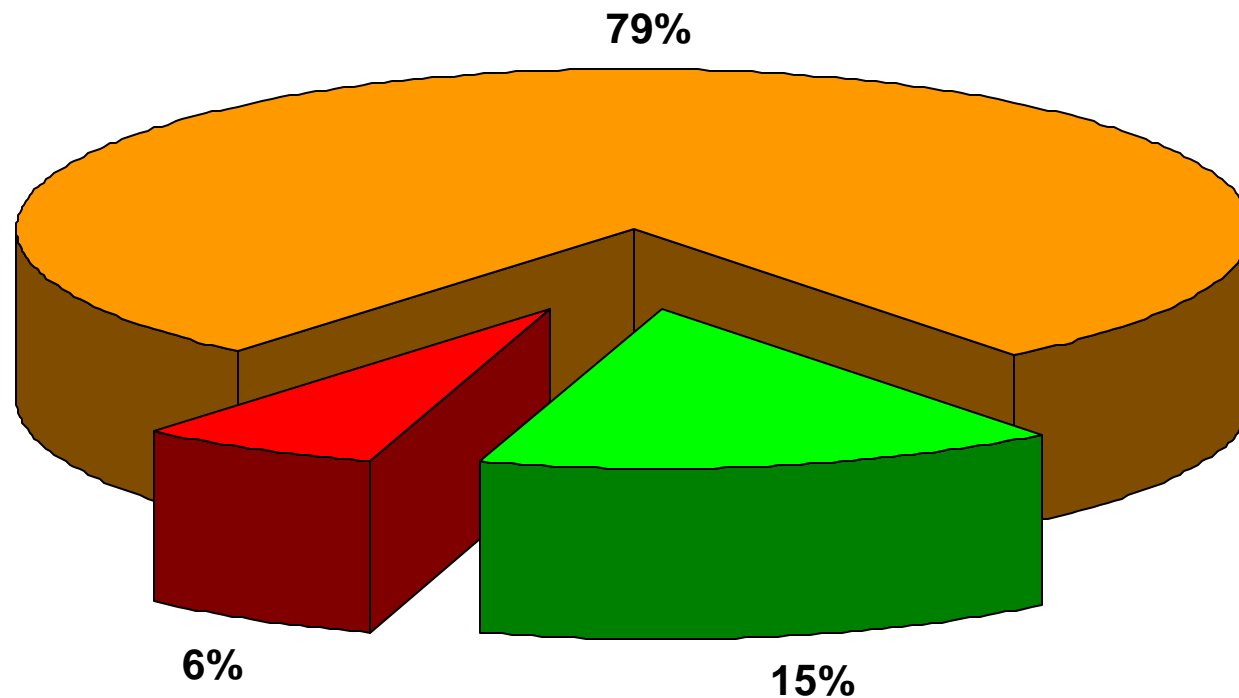


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Non-Porous Substrate Bonding Structural Adhesives

Formulative Technologies



■ 1-Part Non-Volatile

■ 2-Part Systems

■ All Other

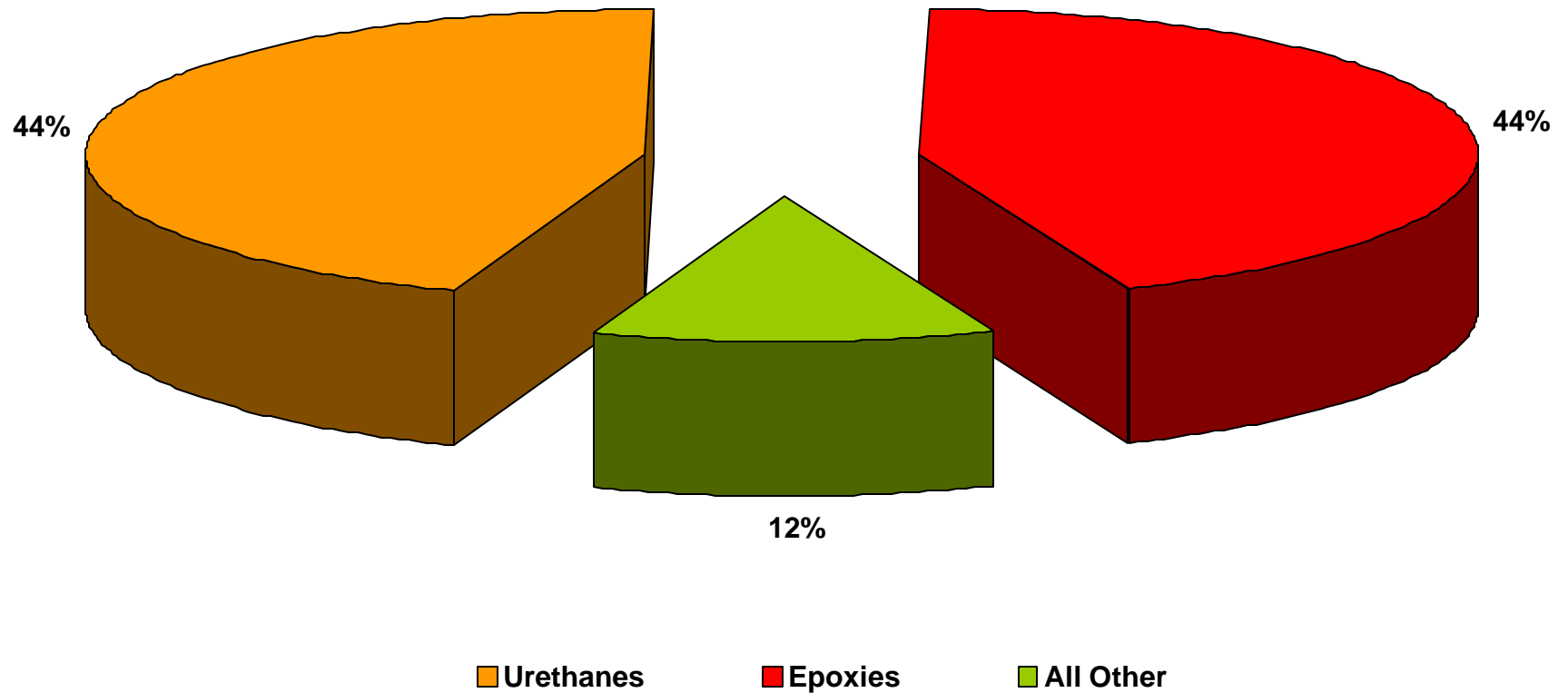


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Non-Porous Substrate Bonding Structural Adhesives

Raw Material Classes



Structural Adhesives

Market Segmentation

Porous Substrate Bonding

\$0.6 Billion

395 MM Dry Lbs

AGR 4.4% / Yr

\$1.52 / Dry Lb.

Non-Porous Substrate Bonding

\$1.2 Billion

260 MM Dry Lbs

AGR 6.6% / Yr

\$4.85 / Dry Lb.



Characteristics of Structural Adhesives To Bond Non-Porous Rigid Substrates

- Solventless or Very High Solids
- Thermoset Adhesives
- Heavily Based on Epoxies, Urethanes
and some Structural Acrylics
- Generally Load-Bearing



So Where Are The Greatest Opportunities?

Replace Mechanical Fasteners

Replace Mechanical Fasteners

Replace Mechanical Fasteners





Areas Of Opportunity For Future Growth Of Non-Porous Substrate Bonding Structural Adhesives

- Replacement Of Mechanical Fasteners

 - Higher Quality Fastening

 - Lower Cost

 - Plastic Bonding

 - Weight Reduction

- New Applications



Features That Could Enhance Future Growth

Adhesive Properties:

Viscoelasticity

Specific Adhesion

Low Toxicity

Thermal Properties

Reversibility

Curable On Demand

Non-Destructive Testing Methods

User Friendly Application Equipment That Lowers The
Overall System Cost Of Using A Structural Adhesive

Better Knowledge By End Users Regarding Capabilities
Of Structural Adhesives

