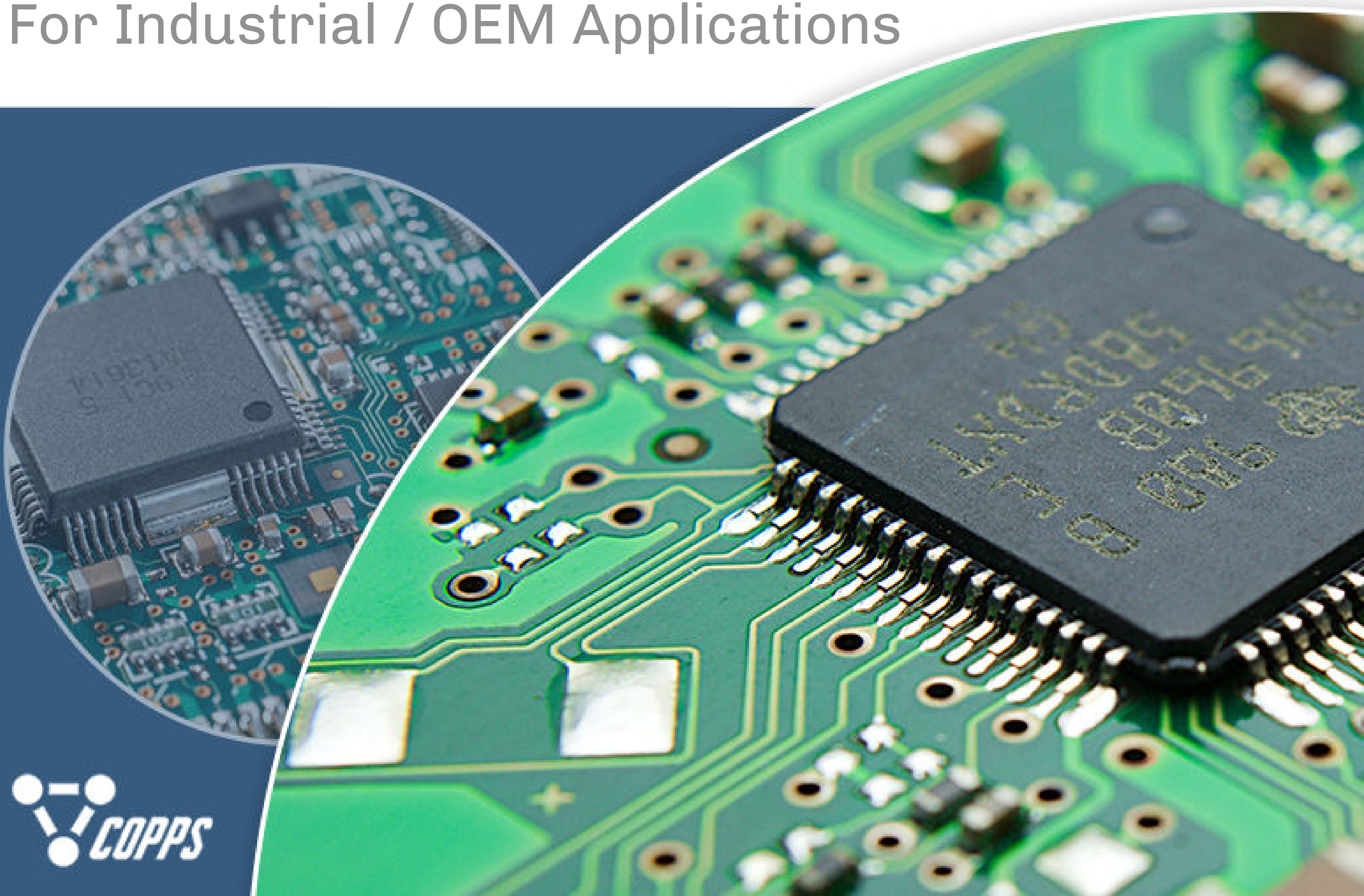
Epoxy Selector Guide

For Industrial / OEM Applications



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Introduction

Selecting the appropriate epoxy for your industrial or OEM application should be a streamlined and uncomplicated process. This eBook will help you select an ideal epoxy that meets the criteria of your application. To begin sourcing an epoxy solution, ask the following:

- Which cured and uncured properties are important to you, and how does that impact the compound you choose?
- Do you have an existing epoxy or urethane process? Is that process designed around the constraints of your compound, or was the compound designed around your process and manufacturing goals?
- Is there any testing or qualifications your product must meet, like an ASTM standard or regulatory requirement?
- What process will be used to produce the part?
- Are the individual components or the system itself spec'd in by the end user? Or are they internally developed, allowing for flexibility?
- Will the part be pre-heated or room temperature? Will the part be heat cured or cured at room temperature? Is a post-cure process in place or available?

These are all important questions to ask when choosing the optimal epoxy or urethane system, and each of these questions are linked to each other. Pulling one string may impact several others, and as such, an optimal balance must be reached within the compound to meet as many of your requirements as possible.

This guide is intended to assist you with answering important questions regarding your product and manufacturing goals, and how these goals will affect the properties of your compound. The following is a list of important characteristics of epoxy and urethane systems, definitions, and potential things to consider when choosing one.

Handling Properties

Epoxy and polyurethane systems can be custom-formulated to improve your manufacturing process. To gain an idea of which properties would be most suitable for your application—and to what amount/degree—here are some consideration points to make sure your system will be a great fit:

Viscosity

Viscosity—thickness and consistency—will influence the extent to which the material will penetrate a part or fiber substrate and will also determine thermal and conductive properties.

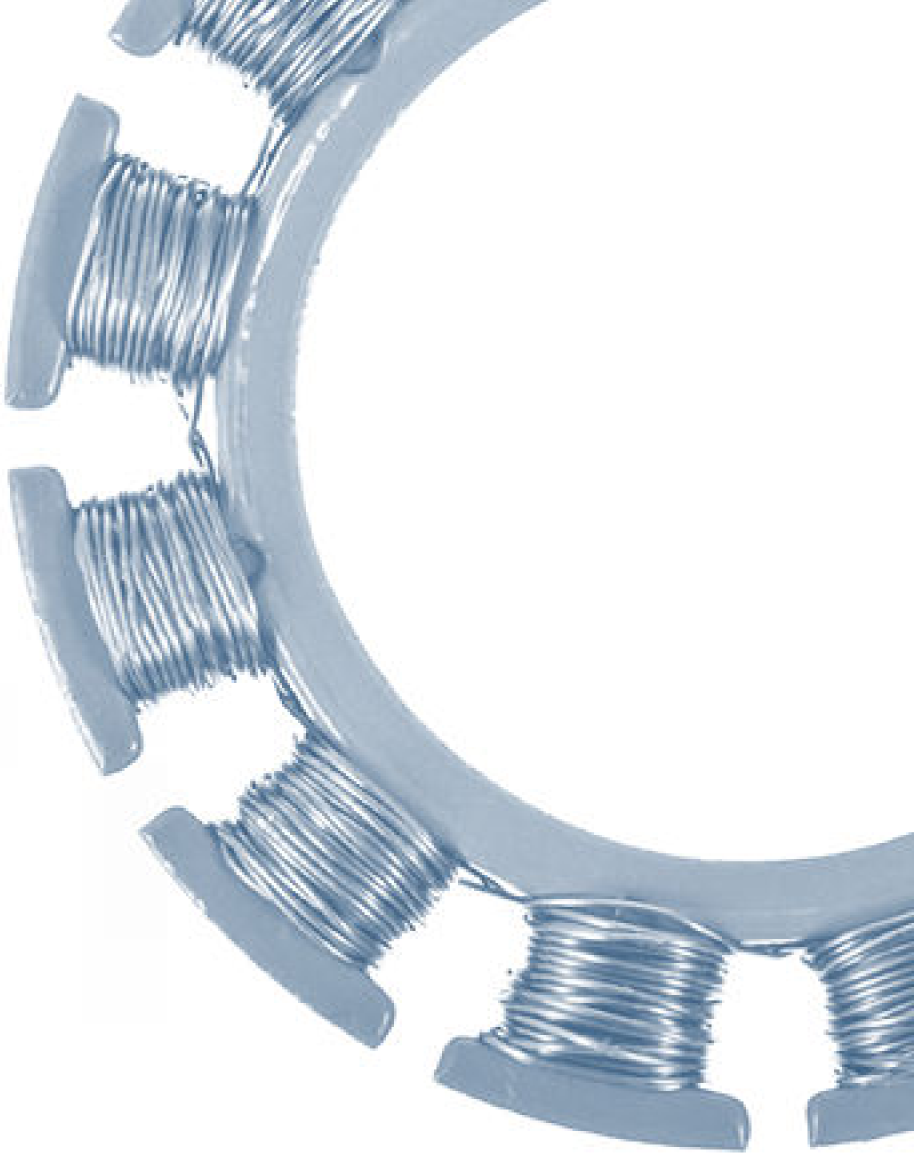
Viscosity is commonly measured in centipoise (cps). Low viscosity is < 2,000 cps, medium 2,000–50,000 cps, and high is > 50,000 cps.

Low Viscosity
< 2,000 cps

Medium Viscosity
2,000-50,000 cps

High Viscosity
> 50,000 cps

Low Viscosity < 2000 cps (Water to Detergent)



Is high penetration into or around gaps important?

Low viscosity materials are best suited for applications where the product is required to flow easily and penetrate deeply into the surface, or fill very small or fine gaps.

Is air release important?

Entrapped air can impede the systems performance and the strength of its bond. Low viscosity epoxies eliminate this possibility as they have excellent air release properties.

Industrial/OEM applications where low viscosity works best: Ignition coils, coatings, and insulation varnish

Medium Viscosity 2,000-50,000 cps (Honey to Ink)

Is it more important to have higher mechanical strength over penetration into/around gaps?

Medium viscosity epoxies create a thickened, high-strength product. Due to their thicker consistency, medium viscosity epoxies offer less penetrability than their low viscosity counterparts.

Is thermal conductivity important?

Medium viscosity systems feature a moderate amount of heat dissipation.

Is increased mechanical strength important?

Medium viscosity systems provide greater mechanical strength and adhesion to their substrates.

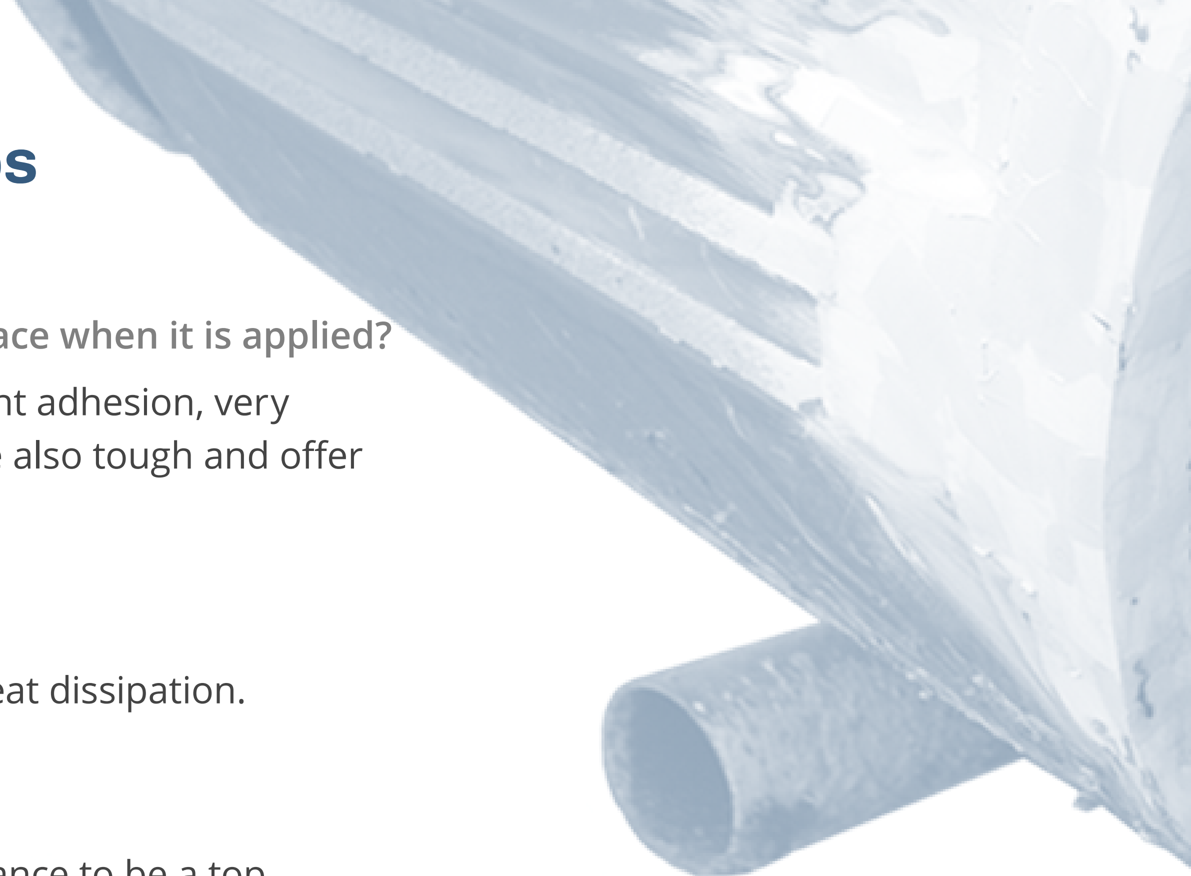
Does your product need flame-retardant properties?

Medium viscosity systems can be formulated to meet UL 94V-0 flame retardant standards.

Industrial/OEM applications where medium viscosity works best:

Electrical Potting and Encapsulation, Transformers, Filter End Caps, Switches and Connectors

High Viscosity > 50,000 cps (Ketchup to Shortening)



Is it important for your product to stay in place when it is applied?

Pastes are highly resilient and provide excellent adhesion, very reliably keeping the product in place. They are also tough and offer heat and shock resistance.

Is high thermal conductivity important?

High viscosity/paste systems offer superior heat dissipation.

Is high temperature resistance important?

For applications that consider high heat resistance to be a top priority, high-viscosity epoxies are a great choice for both low and high temperatures.

Is very low expansion and contraction important?

Paste systems can be adjusted to match the coefficient of thermal expansion (CTE) of the substrate to improve adhesion.

Industrial/OEM applications where high viscosity/paste works best:

Filter end caps, chillers, industrial and structural adhesives

Mix Ratios

Epoxy and polyurethane mix ratios are the proportions of resin to hardener (two-part, Part A to Part B), and are determined by product chemistry. Mixing at the correct ratio of these two factors ensures a proper chemical reaction and avoids any reduction in its physical properties.

By Volume vs. by Weight

Depending on the application, it may be better to proportion part A and part B by volume instead of weight, and vice versa. These ratios are not interchangeable, so it is important that the same by-volume ratio is not applied directly to a by-weight one, as this can lead to problematic errors.

Fractional vs. Non-Fractional Mixing Ratios

Non-fractional mixing ratios are very convenient and easier to manage in the field, such as: 1-1, 2-1, etc. Fractional ratios require more attention to keep accurate, such as 2.3-1, 5.7-1.

Color

The color of the system can be modified with a wide variety of fillers and pigments depending on the application.

Filled vs. Unfilled

If your application requirements dictate a product containing a filler (filled system), this will impart color. If your requirements can be achieved without a filler (unfilled system), then the product will maintain the natural resin color.

Clear vs. Pigmented

The resin system can be supplied clear, if unfilled, or natural resin color if filled. A large range of pigments can be added to achieve a desired color.

Cure Time

The amount of time that it takes a system to develop its full strength will occur in stages. The complete cure time varies depending on factors such as surrounding temperature, mixture quantity, and the formulation design.

Cure time is important to keep in mind, as the faster the material reaches its full strength, the faster the end products can be put to use.

Work Time

Once the resin and hardener are mixed, there is a period of time where the product is still in a liquid state and workable. It is important to apply the material before this phase comes to an end.

Gel Time

During this phase—also known as the initial cure—the mixture transitions into a solidified material.

Complete Cure

Refers to the total amount of time it takes for the system to completely solidify and gain its full strength at a specified temperature.

Room Temperature or Heat Cure

While most systems cure at room temperature and simply need Part A and Part B to create a self-curing mixture, systems with higher temperature resistances require elevated temperatures (200–350° F) to fully cure and achieve maximum performance.

Speed and Efficiency

Adding heat will accelerate the cure time, making the overall curing process more efficient.

Mass Production

Large production runs will benefit from the faster cure time achieved through heat curing.

Very High Temperature and Chemical Resistance

An elevated temperature cure will allow an epoxy system to achieve a complete cure which will increase the heat resistance and chemical resistance of the system.

Minimal Costs

Curing at room temperature involves the lowest capital investment—all that is required are the resin and hardener materials. In order to heat cure, additional equipment such as an oven, heat lamp, or other heat sources would need to be secured.

Small Production Runs

Room temperature curing is suitable for small production runs.

Cured Physical Properties

Epoxy and polyurethane systems can be customized to possess a wide range of cured physical properties. The resin and hardener chosen, as well as the curing conditions (time and temperature), can all impact the resulting properties.

It's important to prioritize your requirements. What are the most important properties of your system?

- Thermal Resistance
- Flame Retardancy
- Mechanical Strength
- Adhesion to Substrate
- Toughness / Flexibility

Depending on the qualities you're looking for, a system can be created to suit your project needs.

Epoxy Solutions from Copps Industries

At Copps Industries, we build our epoxy and polyurethane systems based on the needs of our customer—not the other way around. We provide custom-formulated epoxy solutions for industrial and OEM end users who want a product that is optimized for their application, while also delivering process improvement savings of 15%-50%.

Unlike our competition, we don't just sell you what is on the shelf—we provide a sustainable custom formulation that streamlines your process; lowers your shipping, warehousing, and storage costs; and improves user safety.

Copps Industries has designed and manufactured resins for a broad range of markets including Civil Engineering, Aggregate/ Mining, Structural Adhesives, and Electrical, and Electronics since 1979. We provide sales, customer service, product development, and technical support to over 400 customers in 27 countries.

Discover more about our epoxy adhesive and polyurethane capabilities and services by reaching out to us today.

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