There are a myriad of options when it comes to insulating a busbar. Common alternatives range from shrink tubes, to dielectric films used in busbar lamination such as Mylar (PET), Kapton, and glass epoxy (FR-4). However, this article focuses on epoxy powder coating insulation, a highly customizable insulation which excels in dealing with complex geometries in single-layer busbars.

What is epoxy powder coating?
Epoxy is a dielectric, thermosetting dry powder that is “melted” to flow over the busbar to provide electrical insulation. This powder coating is available in many colors and can be applied in two ways. The first is the fluidizing process, the part is heated, then dipped into a bed of epoxy powder that has been fluidized with air. The epoxy powder flows around the part and then “melts” onto the heated surface. The part is then heated to cure the powder coating. The second method is electrostatic spray. In this method, the part is electrically grounded in a spray booth. As the part is sprayed, the electrically charged powder adheres to the grounded part. Again, the part is heated to flow the powder over the metal conductor. Typically, manufacturers use this method to apply a thinner layer of insulation. However, Storm Power Components has developed a process that allows for multiple layers of insulation, achieving a higher dielectric value. Storm’s ability to spray on thicker insulation passes on savings as well. Traditionally, the fluidized bed method has been used for thick layering of insulation, but this method can only be applied in relatively small batches of parts. Electrostatic spray allows for larger batches of parts to be coated at one time. The scalability of this method yields considerable cost savings.

What are the options?
First of all, why is insulation necessary? Insulation prevents a number of critical design issues such as high-voltage arcing and current-induced magnetic fields, which could interfere with surrounding electronics. Proper management of these effects allows for tighter design margins, saving space and load up the new color. Moreover, special order colors often have long lead times. Moreover, epoxy powder coating design considerations deserve a slightly wider tolerance. By designing a part with the masking process and appropriate tolerances in mind, a designer can save significantly on time and labor costs.

Proper Plating
Plating is a great way to reduce corrosion risk of copper and aluminum busbars. However, designers should recognize that not all plating works in tandem with epoxy powder coating insulation. Tin is a popular plating factor, meaning it creates a slick surface and does not allow the powder coating to properly adhere as well as other finishes. Good alternatives when combining plating and epoxy powder coat insulation to busbar are silver and electroless nickel finishes.

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Design Specifications
Design specifications can prevent weak points in the powder coating insulation. Specifically, epoxy powder coating design considerations deserve a slightly wider tolerance. By designing a part with the masking process and appropriate tolerances in mind, a designer can save significantly on time and labor costs.

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