Ashtabula Rubber Co.

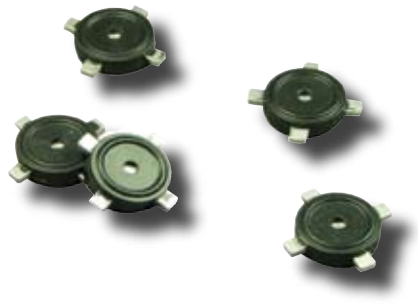
DESIGN • PROTOTYPING • PROJECT MANAGEMENT • GLOBAL MANUFACTURING & SOURCING

Bonding Rubber to Metal or Other Substrates Offers Specific Engineering Benefits

Rubber components are often required for sealing, flow control or damping applications. Depending upon the field requirements, costs and other key specifications, we often find it advantageous to recommend a design using rubber bonded to metal (or to another substrate).

When it comes to sealing and damping, you should seek answers to these questions:

- Can an assembled seal withstand high pressures without being dislodged or distorted, thereby causing a leak path?
- Will an assembled seal function without leaking as aging or low temperatures reduce the elasticity of the elastomer seal?
- If using an adhesive to affix a seal during the assembly process, will the adhesive withstand environmental attack over the life of the assembly or temperature extremes?
- Is there an opportunity to reduce component count and assembly errors by using a rubber-to-metal bonded part?



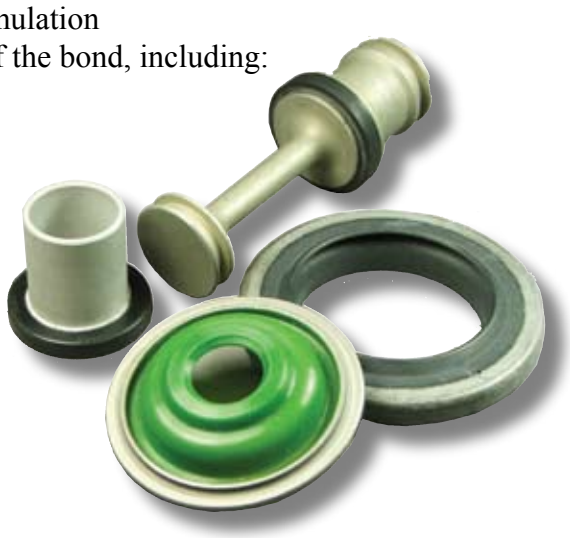
High-pressure applications can offer challenges for designs with assembled seals. Assembled seals (such as O-rings) can become dislodged under high pressure, especially when combined with low temperature environments or over time (as oxidation reduces the resilience of the elastomer). A rubber-to-metal bonded part helps prevent dislodging or distortion of the rubber seal.

The chemical bond achieved by rubber-to-substrate bonding systems during the molding process typically provides superior adhesion when compared to cold adhesives used to secure a seal in a secondary assembly process (such as epoxies or cyanoacrylates). During the molding process, the cross-linking of the rubber polymer itself and the cross-linking of the rubber polymer to the adhesive system occur simultaneously, achieving bond strengths that exceed the tensile strength of the rubber polymer. Because of the covalent bonds established during the molding process, destructive testing shows the polymer will fail before the bond between the rubber and substrate. For the same reason, molded bonded products are often more resistant to environmental chemical attack and hot or cold temperature extremes as compared to adhesives applied in a secondary operation.

Reducing the number of parts in an assembly has obvious benefits in reducing assembly time, inventory costs and transaction costs. Substituting a rubber-to-metal bonded part for two or three assembled components may achieve all three benefits. Additionally, utilizing a rubber-to-metal bonded part can help prevent assembly errors such as incorrect orientation of a seal and/or nicking that might otherwise damage a seal during assembly.

As one might expect, bonding rubber to various substrates requires a specific level of expertise and experience. We factor such variables as:

- The design of the rubber-to-substrate interface
- Use of both mechanical and chemical techniques for forming the bond
- Custom-tailoring the adhesive system to the rubber formulation
- Proper preparation of the substrate to ensure integrity of the bond, including:
  - -Metal cleaning
  - -Sandblasting
  - -Etching
  - -Phosphate coating
  - -Single-coat adhesive systems
  - -Multi-coat adhesive systems, and;
- Tool (mold) design and process control factoring in:
  - -Adhesive thickness
  - -Temperature control
  - -Cycle time control
  - -Cleanliness
  - -Testing to verify the integrity of the bond



Because we service many industries that require flexibility in our approach to problem solving, we have successfully designed and manufactured many different rubber-to-substrate components. We have bonded a wide variety of elastomers including fluorocarbons and silicone to steel, stainless steel, Monel, brass, plastic, lead and aluminum.

Should you have an upcoming project that may require sealing, flow control and/or damping, please contact us. You may discover that we could help you improve the design and performance of your package, lower manufacturing costs and facilitate the assembly process.