

Molded Cable Assemblies: Materials in High-Temperature Applications

Introduction

Many applications require equipment rated for sustained performance at elevated temperatures. The exact performance attributes required vary by application, but typically range from 60 degrees Celsius (140 degrees Fahrenheit) to 260 degrees Celsius (500 degrees Fahrenheit). Some applications expose the connector assembly directly to a flame for a specified period of time, such as firefighter wearables that must survive high heat.

Typically, resin choices have been limited to select families, but recently resin manufacturers have started to formulate more common resins like TPU to survive in higher temperatures as well.

EVALUATION FOR HIGH-TEMPERATURE APPLICATIONS

All aspects of a molded cable connector assembly must be evaluated for high-temperature applications. These typically include:

- Wire/cable insulation and jacketing used in the assembly
- Electrical insulation material used to isolate the contacts/terminals
- Overmold material used to create the transition from the electrical insulation to the cable
- Mechanical hardware components that provide the attachment means for the connector
- Sealing elements that provide additional environmental and ingress protection

Wire/Cable Insulation and Jacketing

Until recently, jacketing materials were very limited for high-temperature applications. Many materials needed to be processed through a secondary application after being extruded, such as an e-beam machine. Resin manufacturers recently came out with more products like a TPU rated to 125 degrees Celsius (257 degrees Fahrenheit). This resin does not need to be processed through an e-beam machine, so cost and lead-times are more attractive

Electrical Insulation

The materials used for high-temperature electrical insulation can vary depending on the application. Plastics typically used for the mid- to high-temperature range are mineral or glass-filled PA family of resins and glass-filled PBT family of resins.

The high- to very high-temperature range requires higher-performing polymers, including the PPSU family of resins and the LCP family of resins. The PPSU and LCP resins require specialty molding parameters and equipment, which are all provided by iCONN as a complete solution package to our customers.

Overmold Material

High-temperature overmold materials can also vary, but tend to assume a rigid form as maximum temperature requirements increase. iCONN has successfully designed and manufactured connectors overmolded in glass-filled PBT family of resins and glass-filled PA family of resins for demanding applications. iCONN engineers use our core competencies and work directly with our customers to not only provide the temperature resistance required but to also maximize the water ingress protection characteristics of the design.

Mechanical Hardware Components

All coupling devices and panel mounts that iCONN has specified for high-temperature applications are either electroless nickel-plated brass or stainless steel. These materials have an extremely high melting point and typically outperform any of the plastics within the assembly.

Sealing Elements

iCONN uses O-rings to seal connections in an application. Those O-rings are typically silicone with an operating temperature of over 200 degrees Celsius (392 degrees Fahrenheit). Silicone's melting point is much higher, but if an O-ring loses its durometer, the seal could be compromised.

iCONN: Providing Quality Every Step of the Way

iCONN's team has extensive connector and cable assembly experience, allowing us to provide our customers with engineered solutions and cost-effective designs for their specific applications. We provide engineering support and manufacture a variety of customer products, including prototypes, quick-turn and low- and- high volume assemblies.

Our business model was developed around a total design concept that considers application constraints, durability, ergonomics, audio and tactical features. We strive to provide cost-effective, robust and quality solutions that meet and exceed pricing and service levels and provide the value necessary to ensure our customers' success.

For more information, contact us today.