OMNETICS
CONNECTOR CORPORATION

INSIDE STORY

The aerospace and defense industry's development of new wearable device applications has grown exponentially in recent years. Enabling these new applications requires ruggedized embedded circuitry, wiring and interconnections capable of performing in challenging environments. Design considerations for developing wearable devices for military operations can vary depending on the application and mobility needs of the device. Travis Neumann, Special Project Manager at Omnetics, discusses the advantages of embedding its miniature ruggedized connectors in wearable device applications for the warfighter.

Aerospace & Defense Technology: Wearable devices have to perform in challenging environments. What are some of the considerations that wearable device designers should factor in when selecting a connector?

Travis Neumann: Someone has to carry this solution, it may be for short distances, or it can be days in the field. Many solutions use lightweight metals or engineered plastics to reduce weight. In recent years we have seen devices wired with conductive threads integrated into fabrics or passages. For an application such as a body camera, users may not want the connections limiting or restricting freedom of motion. Maintaining these connections close to the body may require a right angle or flat type of mate. Battery packs, communications devices, and optics may be positioned in a way that their function is better served with straight connections. When accessibility of devices is the main concern, having the ability to quickly add or remove from a network can be aided by the ability to mate connectors without worrying about orientation or having aligning features integrated within to blind mate.

TRAVIS NEUMANN
SPECIAL PROJECT MANAGER

Aerospace & Defense Technology: Soldier-worn applications can often be subject to sudden movements or impact that could cause accidental unmating. How does Omnetics prevent accidental unmating?

Neumann: One method used at Omnetics employs detented features on the plug side of the connector and a toroidal spring captured in the receptacle connector. Features are sized to allow the mate/de-mate force to either fall within a range or to meet the 'not to exceed' type of requirements. Controlling the force is done through geometry as well as the spring dimensions with proper testing to validate the operating window. Other options in today's marketplace may have push-pull, push and twist, threaded, or fasteners to maintain connection.

Aerospace & Defense Technology: How can the use of ruggedized miniature connectors enable the integration of next generation technologies and new capabilities into wearable devices?

Neumann: We are well into next generation technologies. Devices for use with multiple radios simultaneously to allow communication across groups and platforms are now able to be soldier worn. Multi-use devices such as cellphones have been ruggedized for use in tasks related to navigation, acquisition, communication and many others. Connections are used to transmit both power and data to assist in this data sharing/communication for faster decision making. Power delivery cannot be understated. Now users do not have to carry heavy battery packs either, as charging can be done through the use of flexible solar panels.

Aerospace & Defense Technology: What are some of the innovations Omnetics has applied to its connector technology to help reduce the amount of wiring required to enable wearable device applications for the warfighter?

Neumann: Without question its hybrid connectors to save size and weight. Hybrid connectors integrate different contact solutions into a single connector. One use is power delivery for communications or vision devices as well as additional connections to support data transfer. Power use may require a larger contact due to consumption being greater than 1 amp for example, whereas digital signals have only milliamp requirements, and can reside on a smaller gauge wire or trace. Mobility can be influenced greatly through material choices. Wearables generally have temperature requirements below 125 °C. Decreased temperature requirements can open the door for thinner jacketing, or different, more flexible materials used in the cable. Also, metal backshells are generally replaced with a flexible overmold with integrated strain relief to keep size and weight low. Unseen changes such as increasing the number of wire strands promotes additional flexibility. All these modifications result in a solution that is wearable while being size and weight conscious.

Aerospace & Defense Technology: High-speed data transmission and signal quality are imperative in wearable devices for warfighters. How does Omnetics assure the quality of data transmissions that need to occur within the warfighter's wearable device?

Neumann: It starts as soon as it enters the shop. Incoming cable is tested for both mechanical and electrical parameters. Skew and impedance generally are part of its acceptance. From here it gets built. Omnetics uses crimped contacts which have their own process verifications at the beginning, middle and end of each production order. On some products an in-process test exists to check continuity where others may have testing at completion. In house we can test to 20 gig and after that it would be sent to an external facility for further testing.

For more information, visit www.omnetics.com.