

Environmental Protection & Your Connector (Part I)

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Here in Ohio, where Heilind has substantial operations, we've seen the opening of two casinos in 2012, with two more scheduled to open in the next five months. Spread among these four casinos will be more than 9,000 slot machines, with each machine employing a number of connectors to help it carry out its daily task of separating casino visitors from their cash.

When choosing a connector for a slot machine application the design engineer needn't be too concerned about environmental protection. The device will be housed indoors in a climate-controlled setting. Odds are the harshest conditions it's likely to experience will be the hot air of occasional expletives and – once in a great while – maybe a good kick. On the other hand, when specifying a connector to be used on snow plows – say for example, in Cleveland – it's a different story. In this case you'd want to make sure your connector provides protection from moisture and is rated to perform well in sub-freezing temperatures.

Environmental protection is an important consideration in your choice of connectors. Especially in the industrial sector where products often face exposure to rain and snow, excessive heat, extreme cold, even fire. Plus, in some cases, the design engineer will have to consider such factors as vibration and mechanical impact resistance. So today I offer part one of a two-part series on...environmental protection factors to consider when choosing a connector for your application.

Ingress Protection (IP) Codes, briefly

In varying degrees of efficacy the connector housing seals out solid and liquid contaminants from the connector interface. It also prevents inadvertent physical (think hands and fingers) contact with the electrical contacts. Over the years the non-profit International Electrotechnical Commission (IEC) has codified these levels of protection into the accepted standards we know as IP codes. In IP codes the first digit refers to physical objects and the second digit to moisture.

To quote the Wikipedia page for IP Code:

“The standard aims to provide users more detailed information than vague marketing terms such as *waterproof*. . . . The digits . . . indicate conformity with [various usage] conditions . . . For example, an electrical socket rated IP22 is protected against insertion of fingers and will not be damaged or become unsafe during a specified test in which it is exposed to vertically or nearly vertically dripping water.”

At the other end of the protection spectrum from IP22 is the Molex sealed rectangular connector (SRC) system, a connector that's been tested to an IP69K rating. An IP69K rating means the component provides total dust ingress protection as well as substantial moisture protection. Specifically, the Molex SRC provides moisture protection from effects comparable to and including pressure washing and continuous immersion in water. Given these features, a

connector with a code of IP69K is a good choice for applications deployed in the marine industry and in harsh environments such as those found in agricultural machinery and construction and mining equipment. Connectors rated IP69K are also ideal for vehicles and equipment that require regular, intensive cleanings such as dump trucks, cement mixers, food industry machinery, etc.

Upgrading environmental protection levels on existing connectors

Let's say your customer finds a new use for your product and this new application will expose your product to more moisture than it's currently designed to handle. You're already standardized on a connector but it's not water resistant and the customer's initial order doesn't justify the expense of a redesign.

In this instance, your solution is to add a seal to your existing connector. Adding a seal requires no new design work and no new equipment. Everything else remains the same. Best of all, it works for you and it works for the customer. Everybody's happy.

Goal: Maximum performance for minimum cost

As a product design engineer you want a finished product that performs up to or exceeds the standards and ratings that have been established for it, within the design budget that's been set for it. As with everything else that goes into the design, you want a connector that delivers maximum performance for minimum cost. One way to help yourself achieve this goal is to make sure you don't pay for protection you don't need. And generally speaking, the higher the level of environmental protection your connector is rated for, the more costly that item will be.

That said, we both know there are other steps you can take with your design to provide environmental protection. For example, if your connector resides in a closure you could even use a non-insulated connector. However your design protects its components from the elements, it's a given that you want a very high degree of certainty that those components will be protected.

For many products, such as our slot machine and most consumer electronics, the typical operating environment is such that environmental protection is not a major concern. On the other hand though, and as noted, for industrial sector applications it *is very often* a major concern – with protection from solids and liquids ranking high among the list of environmental factors.

The IEC's IP codes, along with the manufacturers' published performance ratings offer the product design engineer good guidance in selecting the connector that offers the optimum level of environmental protection for a given application. Please check back in the coming weeks as I will be writing about what to look for when choosing a connector that is likely to be exposed to extreme temperatures, shock, vibration, and fire.