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An Alarming Situation on Passenger Railcars

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Audible alarms have been a mainstay on railway vehicles by choice for many decades, but their use on passenger railcars has been mandatory since 1990 with the introduction of the Americans with Disabilities Act (ADA). An audible sound is required to warn when the door is opening and closing for most types of passenger railcars (see insert this page). Besides this basic requirement, however, no further guidelines by the regulations are given. It is therefore up to the system designers of new and refurbished railcars to figure out how to fully implement this directive.

The audible alarm railcar application is particularly challenging due to many unique application characteristics. These include choosing the sound level & type of sound, the unique voltage levels, and the need for ruggedness.

Acceptable Sound Level:

The essential challenge is to find an audible sound level that can be heard at noisy stops without being too annoying to the people not getting off the railcar. Because the audible alarm is being used as a safety warning (i.e. stay away from the opening/closing doors), system designers have to err on the side of caution and use an audible alarm that will be heard even at these louder stops. So how do the system designers minimize the complaints about the audible alarm being too loud or too annoying? This is where picking an appropriate type of sound becomes critical.

Appropriate Type of Sound:

A loud sound can be made less annoying by picking a proper type of sound. Examples of less harsh sounds include chime tones and continuous sounding tones. High frequency beeping tones are considered more annoying and probably should be avoided (think of your electric alarm clock going off). Another way to make a sound less annoying is to choose a lower frequency pitch such as one at 2,000 Hz rather than the standard 3,000 Hz pitch level used for most audible alarm applications. Choosing a lower frequency pitch has an unrelated benefit. As people age, their ears tend to lose the ability to hear the higher frequency pitches. Using an audible alarm with a lower pitch will alleviate this potential concern.

Unique Voltage Requirements:

There are two common railcar power voltage systems. One system has a 72 Vdc nominal with an associated range of 65 to 82 Vdc. The other system has a nominal value that is half as much (37.5 Vdc) with an associated range of 24 to 45 Vdc. In addition, the railcar door electronics may use a lower nominal voltage such as 28Vdc. There are audible alarm models that

ADA Requirements for Railway Audible Alarms

The Access Board is an independent Federal agency that maintains Part 1192 of the ADA Accessibility Guidelines for Transportation Vehicles. The sections that require audible alarms on rail cars are:

1192.53 Rapid Rail Vehicles
1192.73 Light Rail Vehicles
1192.93 Commuter Rail Cars
1192.113 (c) Intercity Rail Cars
1192.175 High Speed Rail Cars

See: www.access-board.gov

cover all of these voltage ranges, but not all options (sound type, sound frequency, package styles, etc.) may be immediately available in an off-the-shelf part.

Because of the unique voltage requirements for railcar systems, it is a good idea to work with audible alarm manufacturers early in the railcar design process to make sure that the sound level, sound pitch, and sound type desired is available in the voltage range needed for the application. It is usually not a problem for the audible alarm manufacturer to modify a current design for a different voltage requirement, but it does take some time. If a railcar system designer waits too long in the design process, his/her audible alarm choices may be limited.

Ruggedness vs Cost:

The need for ruggedness in the railcar application is clear. Electronic components in railcars can experience significant hot and cold temperatures, large temperature swings over a short period of time, and lots of vibration. Railcars typically go 7 to 10 years before they are re-built, so all electronic components must offer a long life. Additionally, one of the audible alarms is typically mounted on the outside of the railcar, so this audible alarm must also hold up under rain, sleet, snow, and/or direct sunlight.

Even for audible alarms designed for harsh outdoor applications, there is a range of products available that balance quality (ruggedness) vs cost (i.e. you get what you pay for). To make the decision on what level of quality to design in, railcar system designers must look at the money lost when an audible alarm fails before the railcar is refurbished or retired. These costs include:

- The low probability but high cost of the liability of someone getting hurt by a door that is closing or opening because the audible alarm has failed.

- The high cost of the railcar down-time while the failed audible alarm is being replaced.

- The lower but significant cost of the labor needed to locate a replacement and physically replace the defective unit.

Because of the above high costs associated with an audible alarm that fails prematurely, and because the initial audible alarm component costs are insignificant compared to the overall railcar cost, it makes sense for railcar system designers to use audible alarm products that have a very high ruggedness (quality) factor. It is not worth the chance nor the system designer's valuable time to attempt to qualify a lower quality line of audible alarms in a railcar application.

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