PIEZO.COM BLOG

Best Applications for Piezoelectric Fans

APPLICATION 1 COMMENT

SHARE THIS

1

BY CHRIS LUDLOW

SHARE THIS

Sign Up for Piezo Tips!

*Email Address**

SIGN ME UP

By signing up you are agreeing to our Privacy Policy.

A few years ago I was approached by a company looking for reliable cooling fan technology. At the time I was not aware, but cooling fans have a bad reputation when it comes to reliability. I learned that traditional fans have bearings that fail due to temperature extremes, dust, humidity, and corrosion. At best, this leads to an annoying squealing noise and, at worst, to a system failure due to overheating.

Piezoelectric "fans" offer a new means of providing forced air cooling using a solid state technology which mitigates all of the failings of traditional fans....with a few extra benefits as well. Working with customers over the past few years I've learned that some applications benefit more than others from piezo cooling technology. I've also learned that the technology offers other unique benefits in addition to superior reliability including operation at high temperatures (and low temperatures), no electromagnetic interference output (EMI), and an ability to operate and survive in dusty and corrosive environments. Based on all of these benefits, here are the top 5 piezoelectric fan applications:

- Telecommunications Equipment
- LED Lighting
- Aerospace Actuators
- Magnetic Resonance Imaging (MRI) Electronics
- Military Electronics

Reliability and network up time are critical for telecommunications companies. Because of this, the equipment that handles our voice and data needs has to be extremely reliable. Most telecommunication equipment will not use traditional fan products -- especially for their outdoor equipment -- due to the poor reliability, so they rely on large, bulky passive heat sinks. As power needs for the chip sets continue to grow and as the footprint of the equipment needs to be reduced to allow for integration into buildings and city landscapes, passive solutions become less attractive. Piezoelectric cooling offers a technology where the life of the fan matches or actually exceeds the life of a typical piece of telecommunications equipment. Additionally, the piezoelectric fans can survive in outdoor environments where traditional fans would not stand a chance. The quiet nature of the fans, especially over time as they are exposed to dust and corrosive environments, is also critical especially when considering indoor applications.

LED Lighting

To recognize the cost benefit of solid state lighting solutions, LEDs need to last for many years. Like all electronics, the lifetime of an LED is directly proportional to the temperatures it experiences. Higher temperatures lead to reduced lifetime. Many systems have to use more LEDs run at a lower power levels than the LED can actually handle to avoid premature failure of the LED. Using forced convection to cool the LEDs would enable longer life and better performance as well as allow for the LEDs to be driven at higher power levels to reduce the number of LEDs (and thus cost) needed for a given lumen output. However, the reliability of traditional fan technology cannot match that of LEDs. Also, the noise output from standard fans, especially in dusty environments will not be suitable for many LED applications where the device is easily within earshot of people. On both of these fronts piezoelectric cooling offers a superior solution over traditional fans. One specific application that seems especially attractive is LED street lights. The benefits of piezo cooling are amplified in this situation due to the outdoor use and due to the long number of hours and high quantity of LEDs used per device.

Aerospace Actuators

In my research of new applications, I came across a great thesis by Gareth Gilson showing how aerospace actuators could benefit from piezo cooling. As you can imagine, the reliability of aerospace actuators is very important. Due to this when cooling of an actuator is required on a aircraft often large, bulky passive heat sinks are used. This solution is extremely reliable but ha

standard fan. Enter piezoelectric fans which would allow designers of these systems to reduce the weight of their components saving fuel or allowing for more payload.

Magnetic Resonance Imaging (MRI) Electronics

Recently I had an MRI -- I'm getting way too old for basketball! If you have ever had an MRI, you may have noticed what I did: the room was kept very cold. This is because it is important to keep the electronics cool and it is not possible to use traditional cooling fans due to their electromagnetic interference (EMI) output. The magnetic field produced by a traditional fan would interfere with the MRI and ruin the images. Piezoelectric fans have no magnetic field to speak of and thus can be used in MRI machines or other electronics that are sensitive to magnetic fields.

Military Electronics

Many military systems have thermal requirements of -55 C to 125 C. A top of the line traditional cooling fan will be rated for -20 C to 85 C, not even close to the military requirement. Also, if a standard bearing type fan was subjected to thermal cycling loads from -20 C to 85 C or operated at 85 C for a long duration of time, its lifetime would be severely reduced. Piezoelectric fans can operate from -55 to 125C and their lifetime is not impacted by thermal cycling or operating at the high end of the temperature range. Additionally, dusty and corrosive environments often seen in military systems will not impact the life of a piezoelectric fan.

Conclusion

So there you have it, applications that require superior reliability, have demanding environmental conditions, require low noise or cannot have any EMI output are ideal for piezoelectric cooling technology. If you have ideas for other applications that could benefit from this technology, please leave a comment. If you want to see a video of the technology or learn more please please check out our website and subscribe to our blog.

Related Posts:

- Piezoelectric Floor Tiles and Harvesting Energy from Pedestrians

SHARE THIS

Best Applications for Piezoelectric Fans">

0

Chris Ludlow

Chief Growth Officer at Mide Technology

WHAT ARE YOUR THOUGHTS?

Enter your comment here...*

Sign Up for Piezo Tips!

*Email Address**

SIGN ME UP

By signing up you are agreeing to our Privacy Policy.

Post Comment

By signing up you are agreeing to our Privacy Policy

COMMENTS (1)

Matthew *5/23/2022, 8:41:31 PM*

I am thinking of doing a masters project using this type of fan for computing usage? Do you think this would be a feasible experiment in a server rack or a high performance computer tower to reduce power consumption? I would love to run specs with various configurations! Please email me if you want to speak further!

Reply to *Matthew*