Cooling Technology for Protecting People

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1. Introduction

In recent years, advances in computers and communication networks have made many electronic devices and information processing devices crucial to our daily lives. Fans are installed in these devices to dissipate heat. Our cooling fans offer best-in-class performance, long service life, and high reliability, and therefore they are used all over the world for a wide range of applications including ICT—5G base stations, servers, and data centers—and medical equipment and the energy field to support our daily lives and public infrastructure.

Moving forward, the more digitized society becomes, the more markets requiring cooling fans will increase as more devices are switched to electronic control. There will be growing demand to provide these fans with high performance at a smaller size.

This article introduces cooling technology using cooling fans that can be found in our daily lives.

2. Cooling Technology in Our Daily Lives

2.1 Technology that improves the ICT field

Due to the faster 5G communication speeds and expanded cloud services, the processing speed and amount of data processed by today's servers are increasing, generating more heat. The density of components inside equipment has also been increasing, and therefore the cooling fans that cool such equipment are required to have high airflow and high static pressure performance.

To improve the aerodynamic performance, we use fluid simulations to optimize the shape of fan impellers and frames and use a 3D printer to create and perform prototype evaluations. We also use 3-phase motors and strong magnets in drive circuits to increase the efficiency, resulting in high airflow, high static pressure, and low power consumption. Figure 1 shows a rack-mount server, and Figure 2 shows a 1U server. These applications require high airflow, high static pressure, and low power consumption, Our 40 × 40 mm fans are used in these applications, due to their high airflow, high static pressure, and reduced power consumption.

Fig. 1 Rack mount server example
(Photo provided by Super Micro Computer, Inc.)

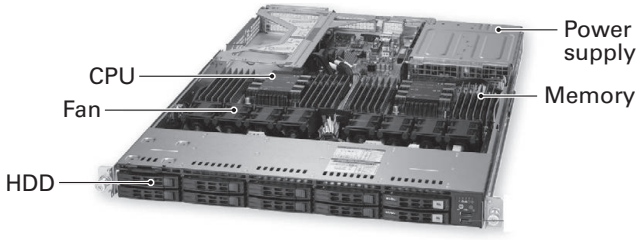

Fig. 2 1U server example
(Photo provided by Super Micro Computer, Inc.)

2.2 Technology that improves the medical field

In the medical field, more and more diagnosis devices are becoming digitized and high performance. Fans are used to cool the inside of these devices. Medical devices are used in quiet locations, and therefore quietness and high reliability

are required.

In addition to carefully designing the shapes of fan impellers and frames, we reduced the electromagnetic switching noise generated from the motor for use in quiet environments. Figure 3 shows ultrasonic diagnostic equipment and Figure 4 shows a medical monitor for displaying x-ray images, where Our Silent Fans are used in both devices.

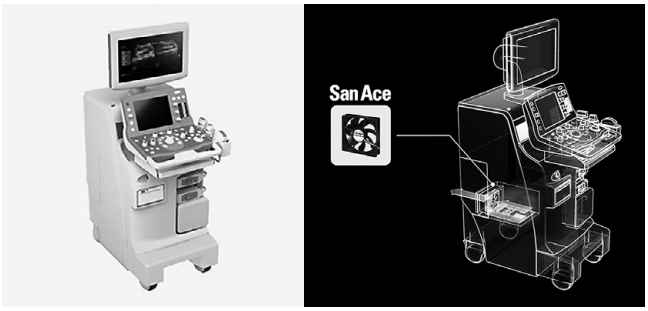

Fig. 3 Ultrasonic diagnostic equipment example

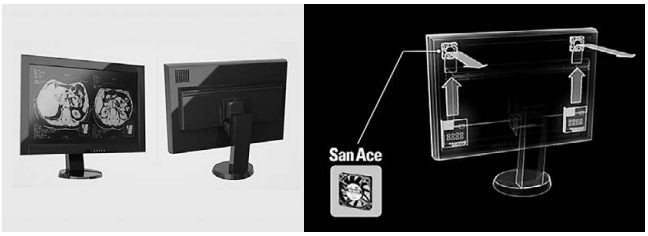

Fig. 4 Medical monitor example

Figure 5 shows a CT scanner. Our G Proof Fans are used in this application to cool the X-ray generating portion that rotates at high speed. The X-ray generating part rotates at high speed and generates a high level of G-force, so the cooling fan used in the equipment must be operable in high G-force environments. We achieved a G-force tolerance of 75 G by revising the materials used and newly designing fan shape and parts-mounting method based on strength analysis simulation data.

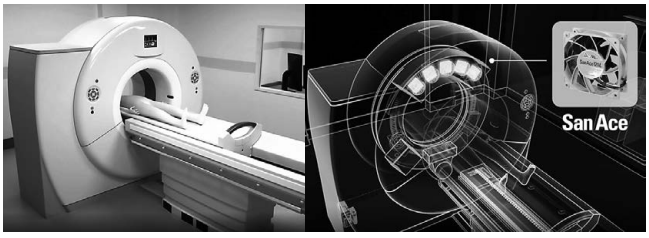

Fig. 5 CT scanner example

3. Cooling Technology for Future Society

As more and more devices are digitized, equipment cooling has become a major issue as more and more devices, including ICT equipment, are controlled electronically. Cooling fans with even better performance will be needed to resolve this issue. At the same time, manufacturers required to have their technology and products comply with Sustainable Development Goals (SDGs), which are initiatives aimed at protecting the environment. Of the 17 SDGs, the two that apply here are Goal 7 “Affordable and clean energy” and Goal 13 “Climate action.”

Also, IoT-based remote control and status monitoring of cooling fans have been increasingly required to increase the safety of equipment. The following sections introduce our technology that can meet these needs.

3.1 Technology that helps develop the energy field

Cooling technology plays an important role in resolving the issue of heat generated in equipment that converts sunlight, wind power, water power, and hydrogen fuel into electric energy. This equipment is mainly installed outdoors, and should therefore provide environmental durability (water and temperature resistance) and should not require service or maintenance over long-term use. High airflow and high static pressure cooling fans that are waterproof, temperature-resistant, and long lasting would therefore play a role in increasing the performance of energy conversion equipment.

Figure 6 shows an example where Splash Proof Fans are used to cool the inside of an inverter in a PV generation system. Figure 7 illustrates our Long Life Splash Proof Fans used to cool the inside of an EV quick charger. In this way, environmental durability technology contributes to the energy field.

Fig. 6 PV generation system example

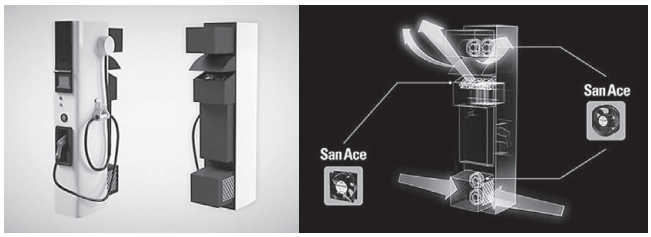

Fig. 7 EV quick charger example

3.2 Technology that helps saving energy and CO_2 emissions

When developing a cooling fan product, achieving higher airflow, higher static pressure, and longer life can reduce the space required for installation and the frequency of required maintenance, helping conserve resources.

Cooling fans can be made more eco efficient by improving the aerodynamic performance and increasing the motor efficiency to reduce the amount of power consumed while operating. Also, PWM control can also be used to add speed control functionality. This can be used to easily control the rotational speed of the cooling fan based on the amount of heat generated by the equipment, helping reduce power consumption.

Figure 8 shows that a new product, *San Ace 92* 9RA type, has a reduced power consumption. The new product consumes 44% less power than an existing product while maintaining the airflow vs. static pressure characteristics.

For details, refer to an article on this in this Technical Report.

3.3 Preventive maintenance

The needs for IoT-based control of cooling fans can be met by *San Ace Controller*, which can remotely control and monitor fans. Figure 9 shows an example system configuration of *San Ace Controller*. With this product, the status of cooling fans installed in areas that are difficult to service and maintain can be monitored, allowing users to create a maintenance plan based on the status. This controller can also be used with various sensors to automatically control cooling fans and efficiently cool or ventilate based on the status of equipment.

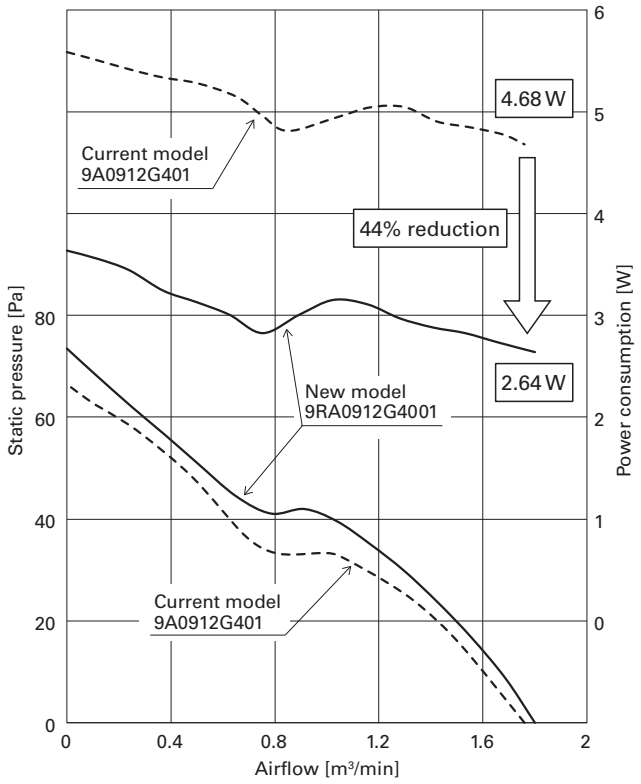

Fig. 8 Comparison of the new product *San Ace 92* 9RA type and an existing product

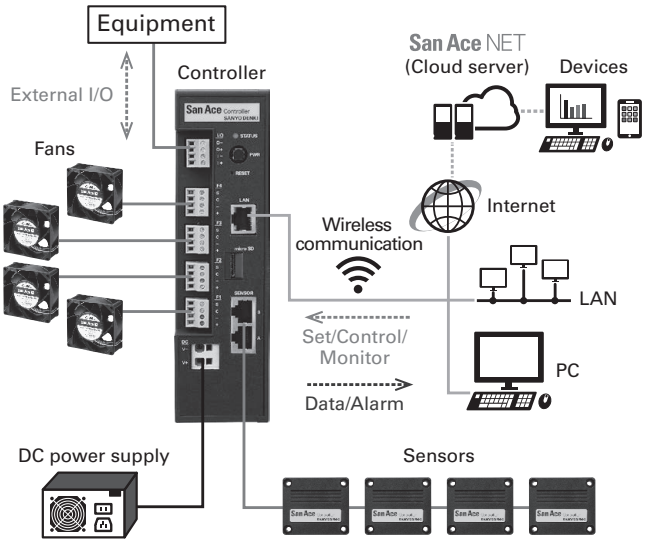

Fig. 9 *San Ace Controller* system configuration

Items used for monitoring can be set freely by the user. If measurement values deviate from these setting values, the user will be notified of the error via email, web browser screen notification, LED indicator on the main unit, or external output. The measurement data and alarm history are stored in internal memory and can be viewed on the web browser screen. Data can then be used to analyze equipment failure and develop new products, which can help make equipment safer and more secure.

4. Conclusion

This article introduced cooling fan technology that improves our daily lives and cooling technology that can contribute to future society.

Equipment has increasingly been controlled electronically. Improvements in cooling fan technology will help increase equipment performance, reduce energy consumption, and reduce the use of resources, contributing to protecting people's daily lives and the global environment.

To develop and provide products that protect people, we will continue to help our customers resolve issues and provide the best products for them.

References

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