80 × 80 × 38 mm *San Ace 80* 9HVB Type High Static Pressure Fan

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1. Introduction

In recent years, ICT equipment, such as servers, storage devices, and routers, have improved in terms of performance and functionality. However, these enhancements have required denser internal component mounting, leading to increased heat generation. As a result, higher cooling performance is being required for these types of applications. We released the 80 × 80 × 38 mm *San Ace 80* 9HVA high static pressure fan (hereinafter, "current model"), but there was increasing demand for a high static pressure fan capable of cooling equipment under higher density and higher heat generating environments.

To meet this demand, we developed and released the *San Ace 80* 9HVB High Static Pressure Fan (hereinafter, "new model"). It features a newly designed impeller, frame, and circuit.

This article will introduce the features and performance of the new model.

2. Product Features

Figure 1 shows the appearance of the new model.

The features of the new model are:

Fig. 1 80 × 80 × 38 mm *San Ace 80* 9HVB type

(1) High static pressure
(2) High airflow
(3) Size suitable for 2U units

The new model improves performance, while maintaining the same size of the current model.

3. Product Outline

3.1 Dimensions

Figure 2 shows the dimensions of the new model. The external dimensions and mounting hole dimensions are unchanged and compatible with the current model.

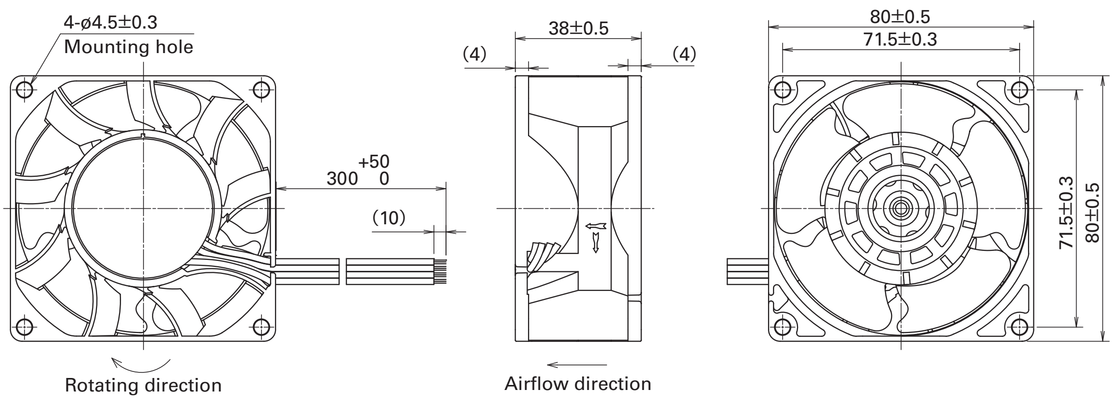

Fig. 2 Dimensions of the new model (unit: mm)

3.2 Specifications

3.2.1 General specifications

Table 1 shows the general specifications for the new model. It is available with a rated voltage of 12 VDC and has a rated speed of 18,300 min^{-1} (G speed).

Table 1 General specifications for the new model

Model no.	Rated voltage [V]	Operating voltage range [V]	PWM duty cycle* [%]	Rated current [A]	Rated input [W]	Rated speed [min^{-1}]	Max. airflow [m^3/min]	Max. airflow [CFM]	Max. static pressure [Pa]	Max. static pressure [inchH$_2$O]	Sound pressure level [dB(A)]	Operating temperature range [˚C]	Expected life [h]
9HVB0812P1G001	12	10.8 to 12.6	100	4.8	58	18,300	4.0	141.3	1,600	6.42	75	-20 to +70	40000 at 60˚C (70000 at 40˚C)
			20	0.17	2.0	4,300	0.94	33.2	105	0.42	40		

* Input PWM frequency: 25 kHz; speed is 0 min^{-1} at 0% PWM duty cycle.
Note: The expected life at an ambient temperature of 40˚C is for reference purposes only.

3.2.2 Airflow vs. static pressure characteristics

Figure 3 shows the airflow vs. static pressure characteristics for the new model. Examples are shown for a PWM duty cycle of 100% and 20% at a rated voltage of 12 V.

3.2.3 PWM control function

The new model has a PWM control function that enables external control of fan speed.

3.3 Expected life

The new model has an expected life of 40,000 hours at 60°C (survival rate of 90%, run continuously at rated voltage and normal humidity in free air).

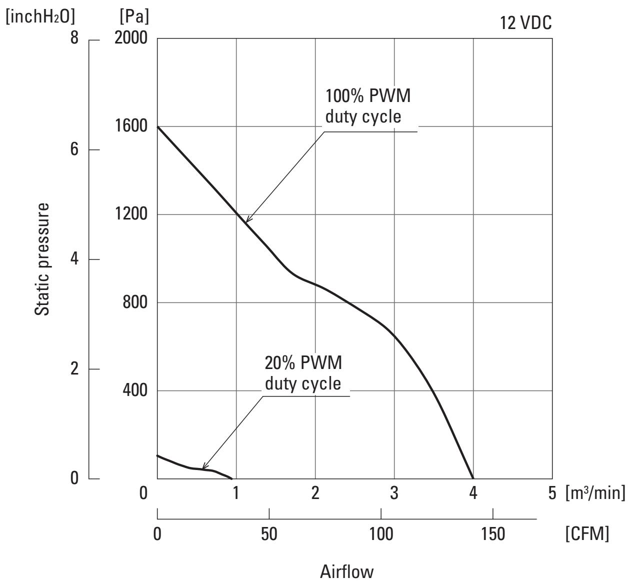

Fig. 3 Airflow vs. static pressure characteristics of the new model

4. Key Points of Development

The new model features a newly-designed impeller, frame, and circuit that improve static pressure and airflow performance.

Next, we explain the key development points and compare the new model with the current model.

4.1 Impeller and frame design

The new model uses a structural design that can withstand high speeds. This enables it to achieve higher static pressure and airflow performance than the current model.

Figures 4 and 5 show a comparison between the new model and current model in terms of impeller shape and frame shape, respectively.

To support higher speeds, the impeller and frame need to be strong enough to withstand the generated stress. To achieve this, we used our proprietary stress simulation technology to select optimal impeller and frame shapes and plastic strengths to maintain the needed strength.

Another challenge that we faced was the higher temperature rise of the motor. This was due to the increase in power consumption caused by the higher speed. We overcame this challenge by improving the cooling performance by optimizing the size, quantity, and location of the air vents on the impeller, especially the air vents on the outer periphery of the impeller. This enabled us to reduce the temperature rise of the motor.

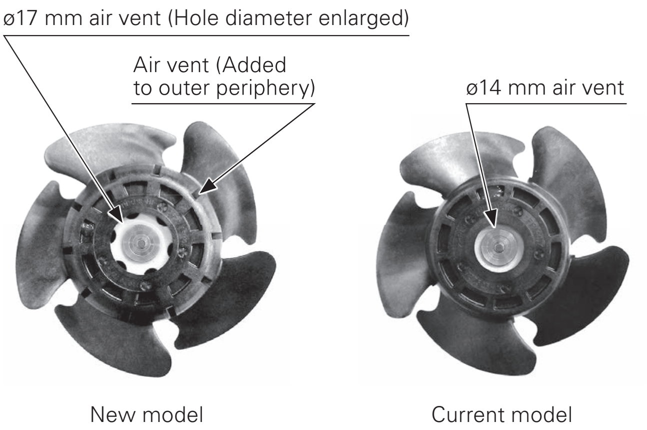

Fig. 4 Comparison of the impeller shapes for the new and current models

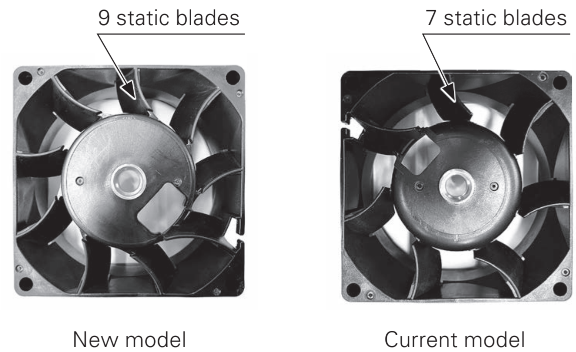

Fig. 5 Comparison of the frame shape for the new and current models

4.2 Circuit design

The new model has the highest maximum-load power consumption among all of our 80 × 80 mm products. In particular, it is 1.6 times higher than that of our current model. The heat generated by electronic components due to the increase in power consumption was a problem. We tried applying some conventional measures such as using multiple components or larger components with higher current capacities. These measures were effective, but not enough to suppress the heat generation.

In addition to selecting highly efficient electronic components, we implemented a pattern design that took into consideration heat dissipation. This enabled us to achieve a circuit design for high speed applications by optimally arranging the components so as to maximize self-cooling via the air vents based on the improved cooling performance of the impeller as described in Section 4.1.

5. Comparison with Current Model

5.1 Comparison of airflow vs. static pressure characteristics

Figure 6 compares the airflow vs. static pressure characteristics of the new and current models. Maximum airflow and maximum static pressure are, respectively, 1.07 times and 1.19 times that of the current model.

5.2 Power consumption comparison with the current model

Figure 7 provides a comparison of power consumption for the current and new models at equivalent cooling performance. When the speed of the new model is lowered by PWM control to have the same cooling performance as the current model, the new model consumes 5% less power than the current model.

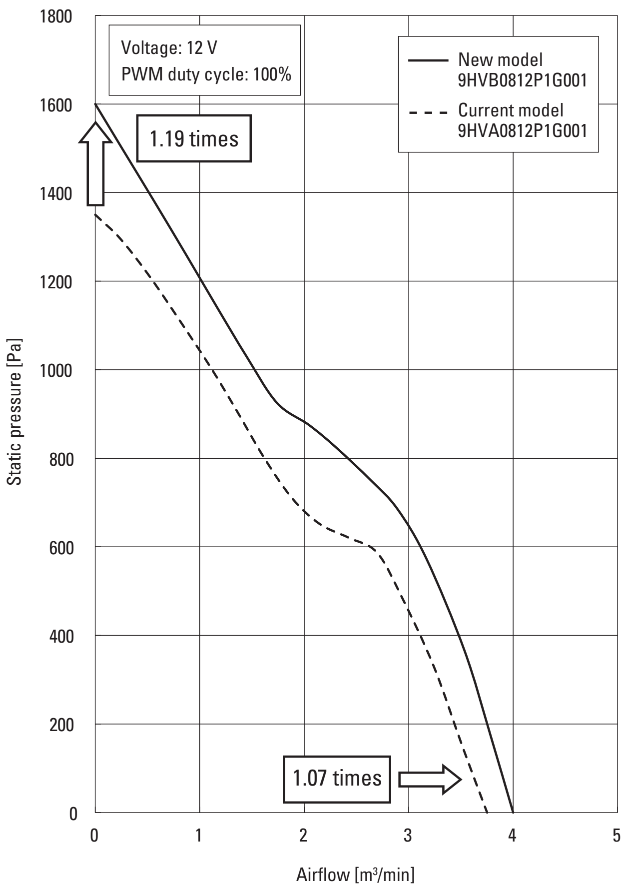

Fig. 6 Airflow vs. static pressure characteristics (Compared with the current model)

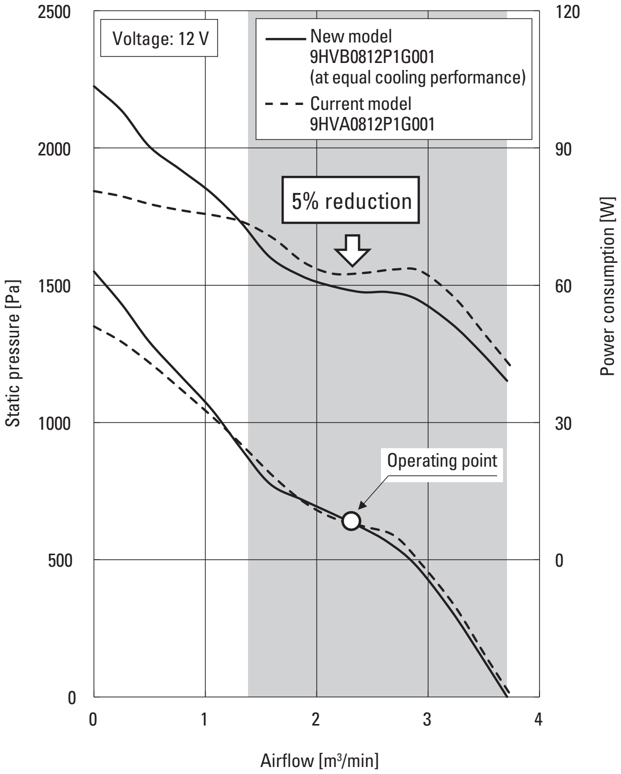

Fig. 7 Power consumption comparison with the current model

6. Conclusion

This article has introduced the features and performance of the 80 × 80 × 38 mm *San Ace 80* 9HVB type high static pressure fan.

The new model has higher static pressure and airflow than our current model.

With high static pressure and airflow, the new model can effectively cooling the equipment that has high density and high heat generation.

We will continue to develop the industry's best fans in terms of performance, reliability, and quality by using future-oriented technologies that enable us to quickly adapt to the demands of customers.

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