High Static Pressure Fan “San Ace 60” 9HV Type

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1. Introduction

The rapid advancement and popularization of information processing and communication technologies in recent years has led to the higher performance and higher density of information and communication equipment. Subsequently, the amount of heat generated by information and communication equipment has also increased, giving way to a demand for fans used in such equipment to exhibit even higher cooling performance.

Sanyo Denki had commercialized the 60 mm sq. 38 mm thick DC fan “San Ace 60” 9GA type, which boasts one of the highest[*1] airflow - static pressure performances in the industry for its size. However, a shift is beginning to take place in the market towards an even higher density and static pressure. In response, Sanyo Denki has developed and commercialized the high static pressure fan “San Ace 60” 9HV type (hereinafter “new model”).

This report introduces the details of this fan. This fan retains compatibility with the conventional model, including size and mounting holes, and it realizes the highest static pressure in the industry[*2].

2. Product Features

Figure 1 shows a photograph of the new model.
The features of the new model are as follows:

(1) High static pressure
(2) PWM speed control function
(3) Optimal for 2U size units

The impeller and frame of the new model have been redesigned, which has enabled high static pressure to be achieved.

Fig. 1: 60 mm x 38 mm thick
“San Ace 60” 9HV type

3. Product Overview

3.1 Dimensions

Figure 2 shows the dimensions of the new model.

The new model has the same mounting dimensions as the conventional model, making it compatible.

3.2 Characteristics

3.2.1 General characteristics

Table 1 shows the general characteristics for the new model.

We have commercialized J Speed (21,700 min^{-1}) with a feedback control function in order to stabilize speed.

3.2.2 Airflow – static pressure characteristics

Figure 3 shows the airflow versus static pressure characteristics for the new model.

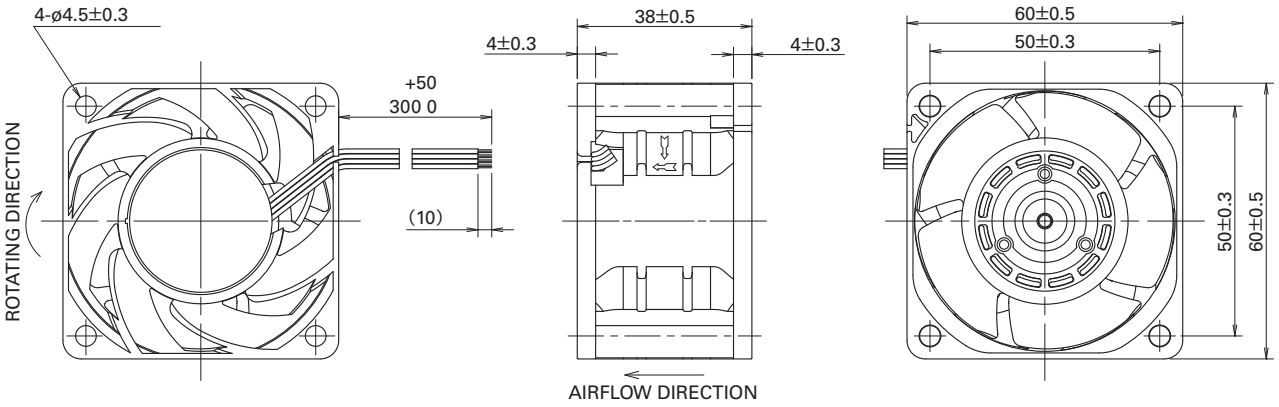


Fig. 2: Dimensions of the new model (unit: mm)

Table 1: "San Ace 60" 9HV type general characteristics

Model No.	Rated voltage [V]	Operating voltage [V]	PWM duty cycle [%]	Rated current [A]	Rated input [W]	Rated speed [min^{-1}]	Max. airflow [m³/min]	Max. airflow [CFM]	Max. static pressure [Pa]	Max. static pressure [inchH₂O]	SPL [dB(A)]	Operating temperature [°C]	Expected life [h]
9HV0612P1J001	12	10.8 to 12.6	100	2.70	32.40	21,700	1.88	66.4	1,750	7.00	68	-20 to +70	40,000/60°C
			20	0.17	2.04	5,300	0.43	15.2	102	0.41	34		

Note 1: Input PWM frequency: 25 kHz
Note 2: Speed is 0 min^{-1} at 0% PWM duty cycle

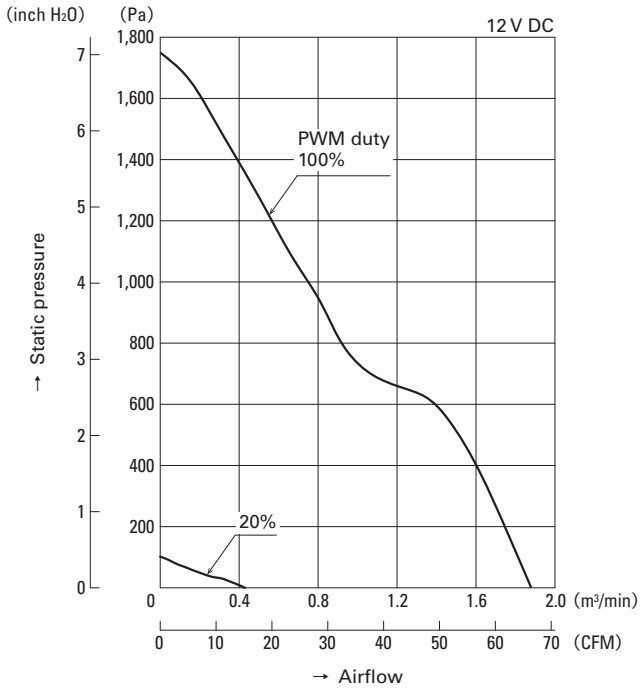


Fig. 3: Airflow – static pressure

3.2.3 PWM control function

The new model has a PWM control function that controls the fan speed from an external source.

By controlling the speed of the fan depending on the heat from the equipment instead of always using the fan at full speed, the power consumption and sound pressure level (SPL) can be reduced for the entire device. Therefore, the demand has drastically increased for fans with a PWM speed control function.

3.3 Expected life

The new model has an expected life of 40,000 hours at 60°C (survival rate of 90% with continuous operation at the rated voltage under free air conditions and at normal humidity).

4. Comparisons with our Conventional Model

By redesigning the impeller and frame and optimizing the motor of the new model, a static pressure significantly higher than conventional models has been achieved.

The following introduces the specific differences between our conventional model “San Ace 60” 9GA type and the new model “San Ace 60” 9HV type.

4.1 Shape comparison

Compared with the conventional 60 mm sq. 38 mm thick 9GA type (9GA0612P1S03), the new 60 mm sq. 38 mm thick 9HV type (9HV0612P1J001) has a static blade with around double the width of the conventional model and occupies more than half of the frame thickness. This structure has made it possible to achieve significantly higher static pressure. Figure 4 shows cross sections of the conventional model and new model, while Fig. 5 shows the respective structures of the static and dynamic blade cross sections.

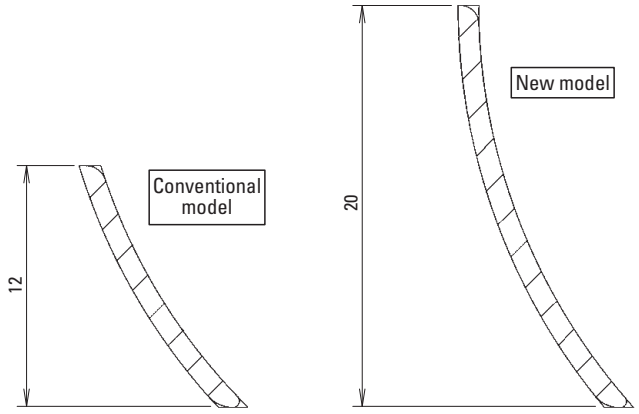


Fig. 4: Static blade cross section comparison

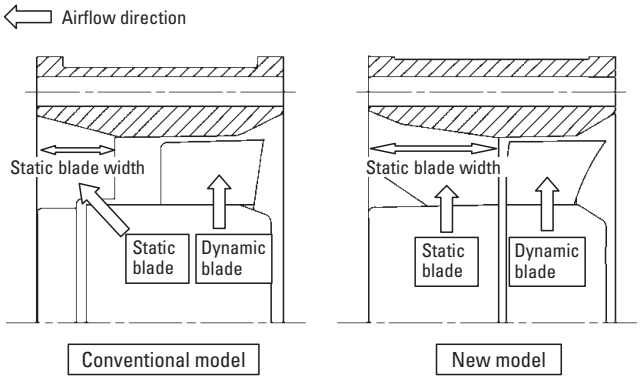


Fig. 5: Structural cross section comparison

Another difference with the conventional model is that the mounting portion of the static blade on the new model has been partially cut out. This has improved static pressure near the inflection point by around 5%. Figure 6 shows photos of the static blade mounting positions.

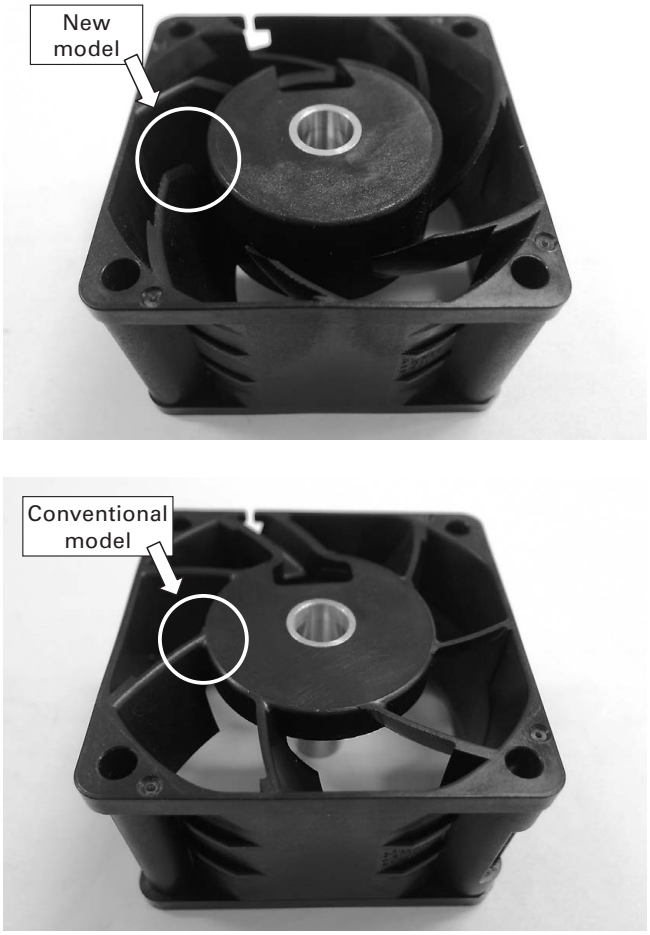


Fig. 6: Comparison of static blade mounting portions

By combining these structures, we were able to achieve the significantly higher static pressure of 1750 Pa with a 60 mm sq. 38 mm thick fan – a feat which has never before been achieved.

4.2 Characteristic comparison

Figure 7 shows the comparison of airflow versus static pressure characteristics between the new model and the conventional model. Although maximum airflow is almost equivalent, static pressure is approximately double.

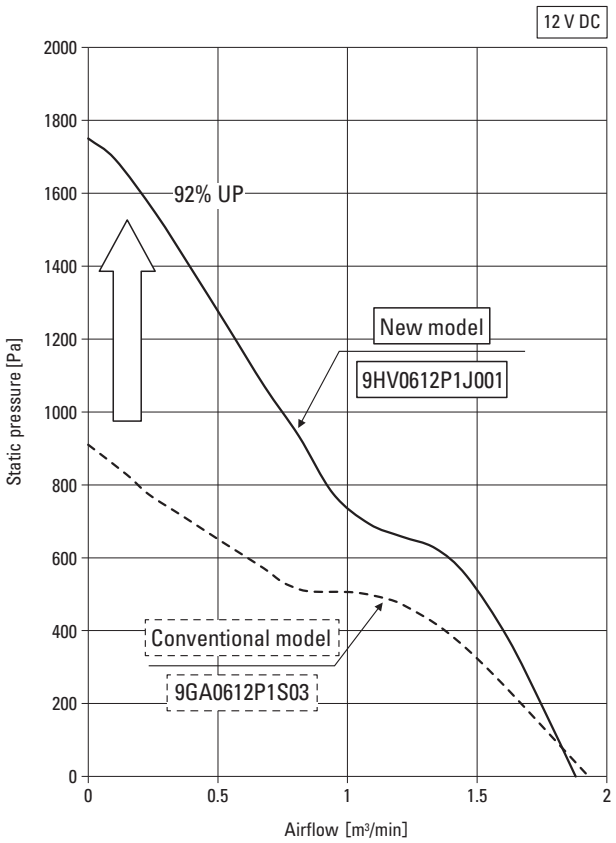


Fig. 7: Airflow – static pressure comparison

4.3 Power consumption comparison (with equivalent performance to conventional model)

Figure 8 shows a comparison of the new model and conventional model's characteristics at a supposed operational point where cooling performance is equivalent.

Power consumption has dropped by around 19%, and sound pressure level has also dropped by around 3.5 [dB(A)]. This means cooling performance can be maintained at the same time as reducing the equipment's power consumption and SPL.

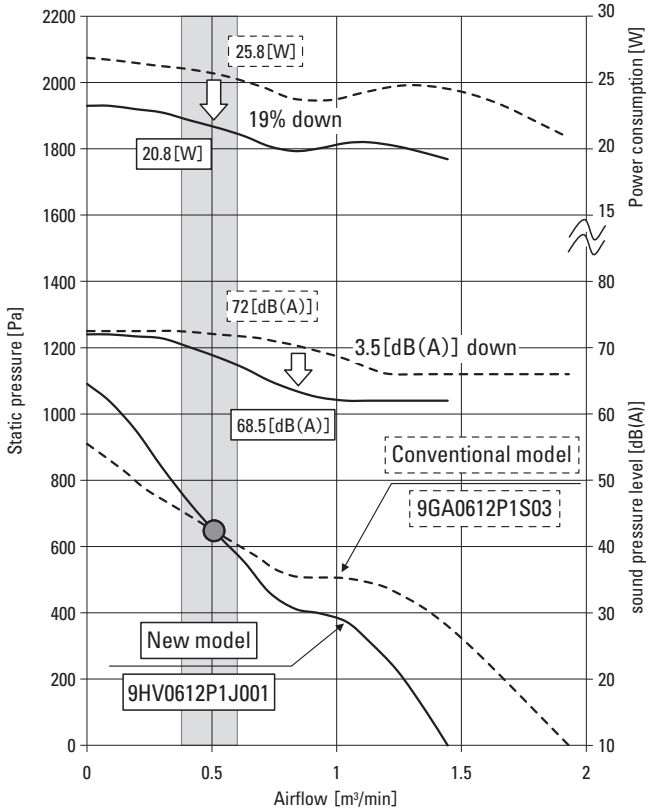


Fig. 8: Airflow – static pressure – SPL – Power comparison

5. Conclusion

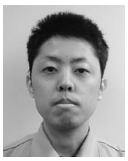
This document introduced some of the features and abilities of the newly developed high static pressure "San Ace 60" 9HV type fan.

By redesigning the impeller and frame of the new model, we have significantly improved static pressure compared with our conventional model. This model also achieves one of the highest static pressures in the industry*2 for the 60 mm sq. 38 mm thick size fan category.

We believe it will greatly contribute to the energy-saving and low SPL shift of equipment which is predicted to intensify in the future in the field of electronic and communication devices.

*1 As of September 2014. As a single-phase axial flow fan of the same size.
Results from Sanyo Denki inspection.

*2 As of December 2015. As a single-phase axial flow fan of the same size.
With a rated voltage of 12 V at 100% PWM. Results from Sanyo Denki inspection.



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