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Flow Analysis for Design Modification of Marine Generator Fan

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Key Words : Generator fan(), Flow analysis(), Scroll geometry()

Abstract

A study for increase of fan flow rate by geometric modification has been conducted to decrease temperature rise of marine generator inner part. Through experiment of a real product, a performance curve for various flow resistances was obtained. Flow analyses for each cases were done by using commercial code-FLUENT and the results were very similar to experimental data (0.7% deviation at normal operating condition). Through flow analysis results for various design geometric modification, a scroll type fan was adopted as a best design geometry with 100Pa more pressure and 22% more flow rate than original fan.

1.

2.

가 3

Fig. 1

(5)

.(Photo 1)

가

(90°)

Photo 2

가

†

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Table 1

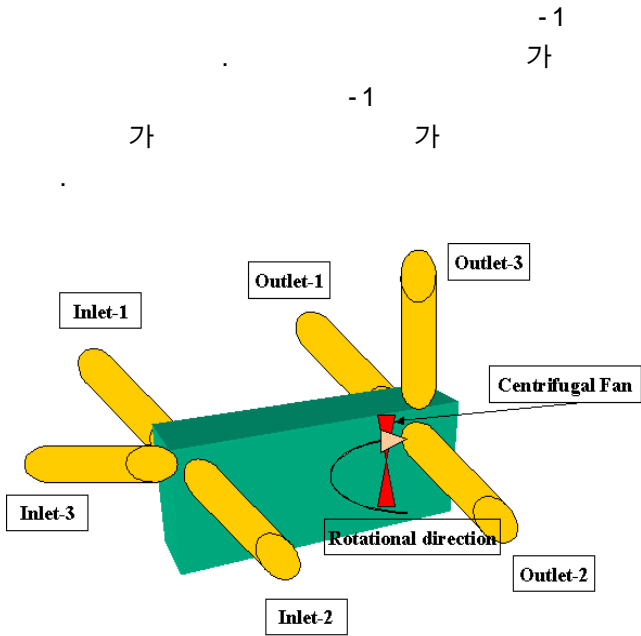


Fig. 1 Generator fan experimental device configuration



Photo. 1 Generator fan & experimental device

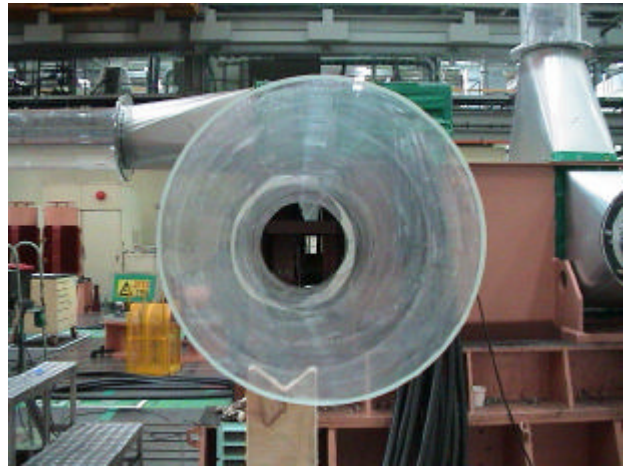


Photo. 2 Pressure resistance device

Table. 1 Experimental mass flow rate data for each cases

	1st Case	Ratio	2nd Case	Ratio	3rd Case	Ratio
-1	0.50	0.34	0.30	0.34	0.11	0.35
-2	0.51	0.35	0.30	0.34	0.10	0.34
-3	0.45	0.31	0.28	0.32	0.10	0.31
(kg/s)	1.46	1.00	0.88	1.00	0.31	1.00
-1	0.40	0.26	0.07	0.07	-0.05	-0.14
-2	0.57	0.38	0.41	0.44	0.14	0.38
-3	0.55	0.36	0.46	0.50	0.28	0.76
(kg/s)	1.52	1.00	0.94	1.00	0.37	1.00

3.

3.1

H S 3

FLUENT
Table. 2

Table. 2 Boundary Conditions

	Total Pressure
	Static Pressure
	720 RPM
	Incompressible Navier-Stokes Eqn.
	Standard κ - ϵ Eqn.

Table. 3 H & S company fan geometry

	H	S
	554	552
	830	830
	190 mm	208 mm
	190 mm	109 mm
	11 EA	9 EA
	48.3 °	14.9 °
	35.6 °	50 °
	Arc	Straight

Table 3 H S
가
H 가 S
가

Table 4

Fig. 9 H
278 Pa, 280 Pa

400, 390 Pa

S
S 가
가 S H
가

Fig. 2, 3 H

Fig. 2

(end winding)

Table. 4 H & S company fan performance results

	H	S
(Pa)	400	390
(Pa)	278	80

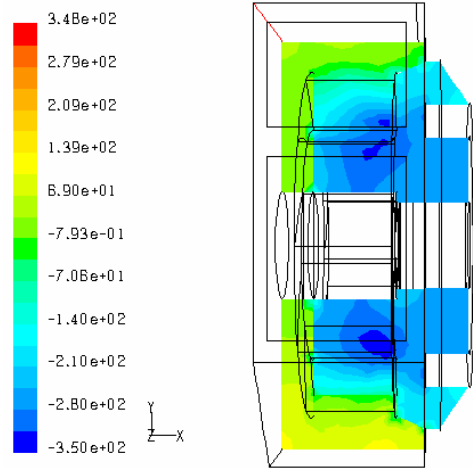


Fig. 2 Pressure distribution of H fan(side view)

Fig. 3 가 , 가 가
가
가

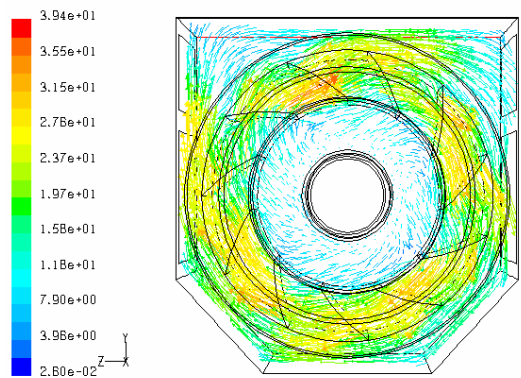


Fig. 3 Velocity distribution of H fan(front view)

3.2

Table 5

forward 15 가 505mm
 backward 11 가 350mm
 1~2 H

Fig. 4, 5

가 가 가
 6
 9
 10, 11 Scroll
 190, 254mm
 Fig. 4

Fig. 7 Scroll

가
 가
 Fig. 8

Scroll 가 1.18 m³/s
 22% 가 1.44 m³/s

가

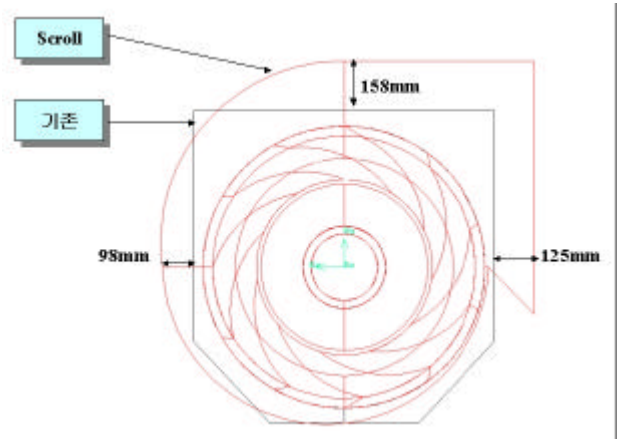


Fig. 4 Comparison between original & scroll type geometry

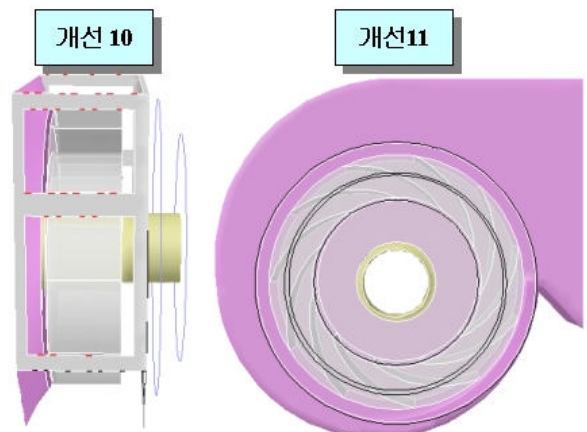


Fig. 5 Back disk blockage & scroll type geometry

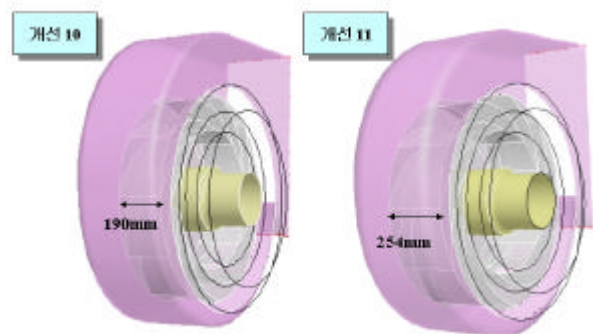


Fig. 6 Scroll type fan with different width

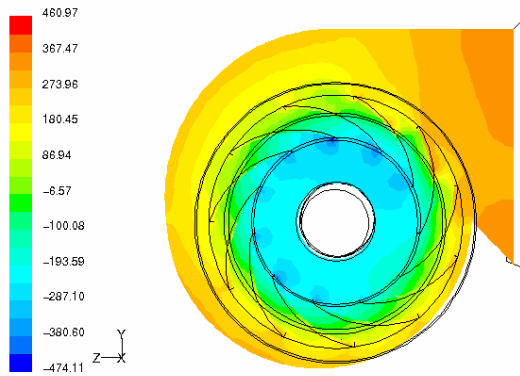


Fig. 7 Pressure distribution of H company scroll fan (front view)

Table. 5 The performance comparison of design modified models

Model	Modification	D.P. (static, Pa)	Change (Pa)
H		278	-
S		70	-208
1		281	+3
2		234	-44
3		200	-78
4		13	-265
5	forward	100	-178
6	15	130	-148
7		300	+22
8		404	+126
9		270	-78
10	Scroll	370	+92
11	Scroll (64 mm) 가	400	+122

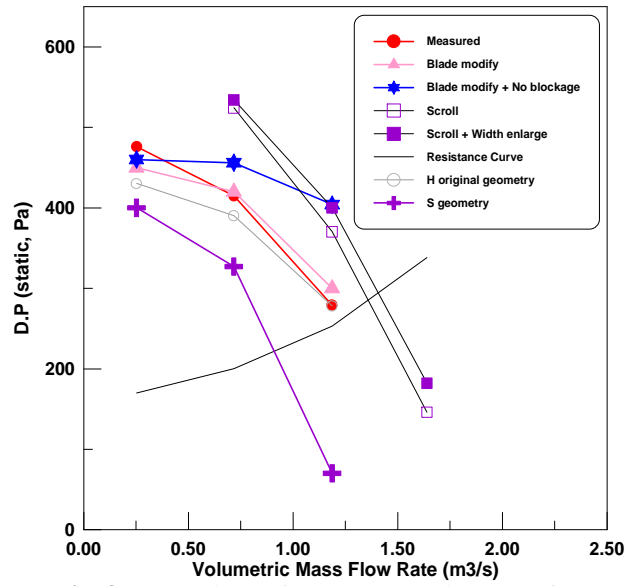


Fig. 8 Comparison of Exp. & analysis results for various design geometry

4.

(0.7%)
 scroll 가 100Pa
 가
 22% 가

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