

풍력발전기 타워에서 바람에 의한 진동

Wind-Induced Vibration at the Towers of Wind-Turbine Generators

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1.

2.

가 (tower) (wind turbine)

가 가

(1) 가 가 (3)

(vortex) 가 가 (2)

(vortex shedding)

가 Tacoma 가 18 (3) 1940 m/s (resonance)

(4) 가

(5) 가

(6) 가 (1)

가 (2)

가

6 kW , 750 kW , 2 MW

ANSYS-CFX

Fig. 2

2 MW 12 m/s 3.5 m

$f(x)$ (3,4)

$$f(x) = S \frac{V}{D(x)} \quad (1)$$

S Strouhal

Reynolds 가 10^3 10^5

Strouhal 가 0.21 ± 0.02 (3,4)

$D(x)$ 가 6 kW 0.2 m, 750 kW

2.3~3.7 m, 2 MW 3.0~4.2 m

14 m/s 가

V

2

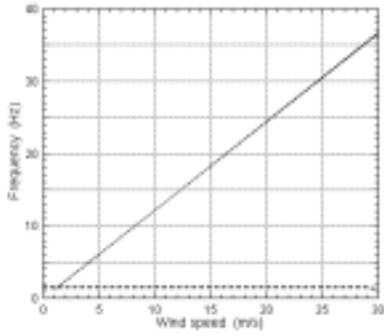
Fig.



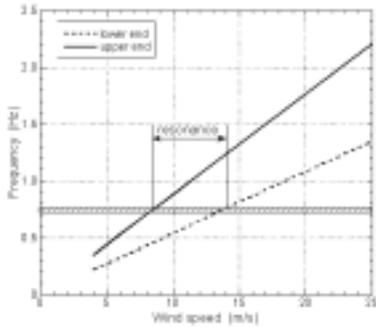
Fig. 1 Flow-field due to wind vortex around the tower.

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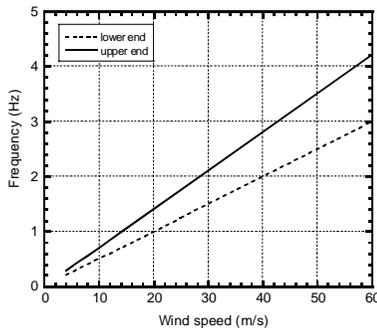
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(a) 6 kW tower



(b) 750 kW tower



(c) 2 MW tower

Fig. 2 Vortex-shedding frequencies and natural frequency of the tower.

3. 가

6 kW 750 kW
 가 Fig. 2 (a) (b)
 . 6 kW 1~2 m/s
 가
 , 750 kW 8~14 m/s

가 가
 2 MW

가 가 가
 가 $F(x,t)$

$$F(x,t) = F_0(x) \sin[2\pi f(x)t] \quad (2)$$

가 $F_0(x)$ (4)

$$F_0(x) = \frac{1}{2} \rho V^2 D(x) C_D \quad (3)$$

가 가 V

4.

가

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 가

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