

E.A. Lazarchuk

THE PECULIARITIES OF WIND TURBINE ACOUSTIC NOISE RADIATION AND MEASUREMENT

State MBDB "Raduga"
2-a Zhukovsky Str., 141980 Dubna Moscow Region Russia
Phone: +7 09621 5-16-14; FAX: +7 09621 2-35-28

The acoustic noise radiation (especially its infrasonic part) is one of the wind turbine quality parameters.

Principal sources of a wind turbine noise:

- mechanical noise from transmission , multiplier (multiplying wheels), generator;
- discrete frequency noise at the blade passing frequency and its harmonics,
- aerodynamic noise: trailing edge noise, separation – stall noise, tip vortex formation noise, laminar boundary layer vortex shedding noise, trailing edge bluntness vortex shedding noise,
- noise due to turbulent inflow.

Wind disturbs the general level of noise measurements. To diminish the wind influence the measurements are carried on at the reflection or absorption earth plane.

We generalized the statistic data about wind turbine noise measurements and obtained the next empiric equation for wind turbine acoustic power:

$$L_{w8} = 0.013 (\lg W)^2 + 7.4648 \lg W + 82.418$$

$$L_{w8} = 75 + 17.2 D$$

$$L_w(V) = L_{w8} - 6.64 + 0.83 V$$

$$L_w(V,D) = 68.36 + 17.2 \lg D + 0.83V ,$$

where

L_{w8} - wind turbine acoustic power (in decibel) at the wind velocity $V = 8$ m/sec,

D – wind turbine windwheel diameter (in meter),

W - wind turbine power (in kilowatt).

Achieved empiric equation can be used for wind turbine, which has a horizontal main shaft and three blades.