

WIND POWER OF THE PAST, PRESENT AND FUTURE

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Nowadays alternative energy using non-traditional and renewable energy sources is one of the main directions of technological development in the world. The availability of an inexhaustible resource base and ecological friendliness of renewable energy sources is their decisive advantage in the face of exhaustion of resources and growing rates of environmental pollution.

One of the alternative sources of energy is wind power that produces no air or water pollution. The energy of wind is used by humans from time immemorial. At first, it was a sail, then a wind mill. Modern electric power generators appeared only in the twentieth century. But over the past decade, the spread of wind turbines has increased by more than 25 percent per year [3].

With the help of a wind turbine it is possible to convert mechanical energy of the wind into electric energy. Ancient wind turbines had wooden blades and could use about 7% of wind power. Thanks to the innovative work of Thomas Pergy, who at the end of the XIX century carried out about 5,000 experiments with various types of “wheel” (i.e. a rotor), wooden blades gave way to curved metal blades, which doubled the efficiency of the plants by up to 15% [2].

The disadvantages of windmills mostly consist of complaints from local citizens that wind turbines are noisy. But an essential feature of modern wind turbines is the low speed of rotor rotation. Thanks to the innovations in the design of powertrains, the speed of rotor rotation decreases to 9-19 rotation per minute [1, p.110]. This contributes to a significant reduction in the noise level of wind turbines.

Modern wind turbines have a nominal capacity in the range from about 600 kW to 5 MW and in theory they can have 59% efficiency, but it would be an ideal wind wheel. In fact, their efficiency is 45% at optimal wind speed. This result can be achieved at the location of power plants with stable winds, for example on mountain peaks.

There are two fundamentally different designs of wind power plants: those with a horizontal and vertical axis of rotation.

Wind turbines with horizontal axis require an additional orientation device. However, they are known to have high wind power usage ratios and relatively small dynamic loads.

For a long time the essential disadvantage of devices with a vertical axis had been that the blades of turbines during rotation created periodic impulses, which led to additional loads on the elements of the design. Later this disadvantage was eliminated by applying the helical turning of the turbine blades.

Despite its ecological friendliness, the wind is also volatile: if it does not blow, there is no electricity produces. Nevertheless, wind energy is developing rapidly, because it is renewable, environmentally safe and inexhaustible source of energy in contrast to the polluting, exhaustible fossil fuels.

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