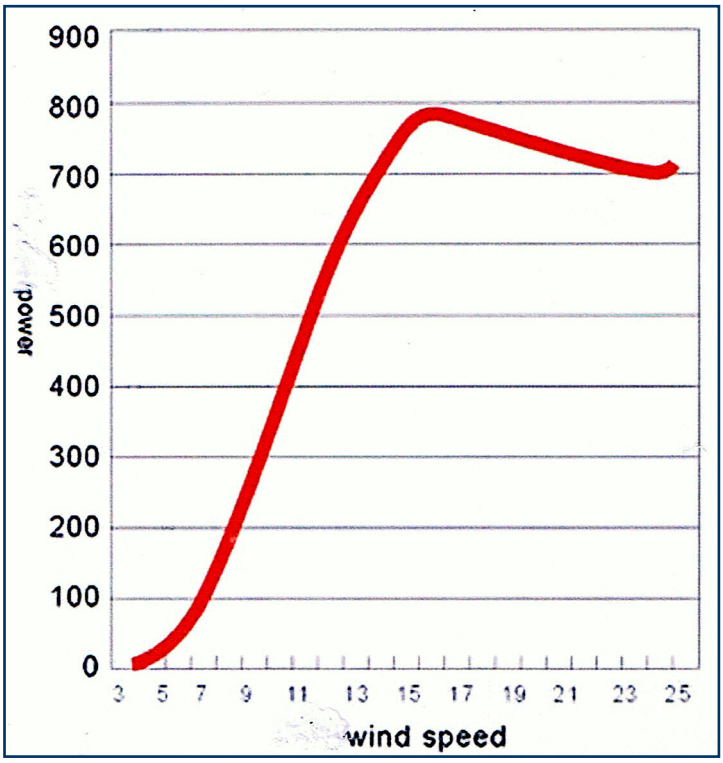
TECHNICAL DATA

Avionex 800KW Wind Turbine



Rotor

Type Three-blade, horizontal axis
Position Upwind
Diameter 50m
Swept area 1962.5m2
Synchronous rotor speed 21.56 rpm
Power regulation Stall regulation

Blade

Type Self supporting
Blade 24m
Max chord 2.3m
Material Fiberglass reinforced, polyester

Aerodynamic brake

Type Pivotable blade tip
Activation Hydraulic Passive activation by
Centrifugal force in over speed

Load supporting parts of nacelle

Hub Cast, nodular cast iron, oblong
Holes for pitch adjustment
Main bearings Spherical roller bearings
Main shaft Forged, alloy steel

Transmission system

Coupling shaft-gearbox Shrink disc
Gearbox type Two stage helical, cast gearbox
Housing, splash, lubrication,
Labyrinth seals
Gearbox ratio 1:70
Coupling gear-generator Flexible rubber coupling

Generator

Type Asynchronous
Nominal power 800 kw
Synchronous speed 1500rpm
Voltage 690v

Nacelle bedplate

Type Fabricated steel construction---Corrosion protection Hot-dip galvanized

Yaw system

Type Active
Yaw bearing Externally geared, dust-shielded
Yaw drive Electric motor with combined helical and

Planetary gearbox controlled by wind-wane
Yaw brake Passive with sliding shoes

Controller

Type PLC Microprocessor
Based, self diagnosing
Remote monitoring Prepared

Tower

Type Tapered tubular tower
Hub height 57.92m (1190 Ft.)
Corrosion protection Hot-dip galvanized and painted

Operational data

Cut in wind speed 3.5 m/s,
Nominal power at approx 14 m/s,
Cut-out wind speed 25.0 m/s,

Double-Fed With Gearbox

Design Concept Notes:

The Avionex / 800kw is a three blade, Dual Wind (Low wind – Hi wind) turbine whose benefits rest in its maximized annual energy yield and its optimum adaptablity to every grid location worldwide.

All components of the machine like rotor, nacelle and tower, were designed by using measured input loads and finite element modeling and analysis techniques. This ensures an efficient structure to absorb the extreme and fatigue loads.

The design-principle of the rotor, the gearbox; the yaw-system, control-and monitoring system and the towers for the Avionex / 800kw turbine is to provide high efficiency, cost effective and reliable operation, as well as ease of assembly and maintenance.

Rotor

The rotor consists of three blades rigidly flange-mounted on a cast hub. The overall diameter is 50 m giving a swept area of 1962.5 m2 . The rotational speed is 21.56 rpm.
The material of the blades is a glass-fiber reinforced plastic (GRP). Each blade tip is pivotable and can be turned 74 degrees to the main blade. The three blade tips are working by an independent hydraulic-system. The hydraulic-pressure is required to keep the tips in the operational position.

Gearbox

The gearbox is a planetary/spur gear system. These components are designed and constructed by an experienced transmission manufacturer in accordance with Avionex / 800kw specifications. The ratio is about 70. Vibration dampers specially developed by the Manufacturer are used for the decoupling of structure-borne noise. These guarantee maximum attenuation between gearbox and machine bed.

Brake System

The blade tip adjustment works independently in each individual blade. If one system fails, the aerodynamic brakes in the other two blades continue to be active. Even at maximum output, extending and twisting just one blade tip is sufficient to bring the plant into the safe rotational speed range. In addition, there is a mechanical disk brake on the high speed shaft between drive train and generator. The two braking systems, the aerodynamic and mechanical disk brake, work independently of each other. In order to guarantee safe braking even in the event of failure of individual components (the hydraulics, for example) or a mains failure, the braking systems are confirmed to be fail-safe. Besides this, an independent power supply is provided for the controller that guarantees safe braking of the wind turbine in the event of a voltage or grid failure.

Generator

The generator is a single stage, asynchronous machine. The generator is of protection class IP 54. Cooling is effected by force-air ventilation. Temperature sensors are installed both on the bearings and in the windings for monitoring the machine temperature. Various covers, e.g. on the high speed shaft, make it impossible to come into contact with moving parts. The housing of the generator is earthed in order to provide equipotential bonding. The generator is elastically supported on the machine bed by noise and vibration-decoupling and damping units. For the sake of improved noise insulation and decoupling.

Yaw System

The nacelle is connected to the tower by means of a four-point bearing. Yawing of the nacelle is achieved by means of two electrical motor drives. Hydraulic brakes serve to secure the nacelle. In the case of grid failure the brakes are activated. An electronic wind-direction sensor system with the corresponding software controls the switch-on time and the direction of rotation of the motors. It also operates the automatic cable untwisting when under varying wind direction the plant has turned repeatedly in one direction.

Nacelle

The nacelle is fitted with a sound-proofed GRP covering. In order to provide optimal conditions for servicing and maintenance, the nacelle is of sufficiently large dimension. Maintenance work can be done even in poor weather without opening the nacelle covering. Access from the tower into the nacelle is gained via a hatch in the basic frame. There is additionally a maintenance platform for accessing the components underneath the basic frame. All components, as for example the azimuth system and the hydraulics, can be operated via the control panels of the nacelle. For safety there is an “emergency button”.

Tower

The tower is made from rolled steel sections and consists of three segments, regardless of the hub height In accordance with safety regulations there are various assembly platforms in the tower
as well as additional landings incorporated into the ladder. An internal ladder makes it possible to ascend regardless of the weather. The power cabinets are accommodated in the bottom of the tower and are thus protected against the effects of weather. The plant can be completely operated from here. For safety, an “emergency button” is provided here as well as an operator’s console for each power cabinet

Corrosion Protection

All parts of the plant, from the tower through the machine bed and on to the nacelle covering, are protected by a special multiple coating against corrosion and other environmental influences. The coating system complies with all the requirements necessary for extreme weather conditions.

Lightning Protection

The rotor blades are fitted with a proven lightning protection system. Lightning is led away via receptors in the rotor tips and the “tip tables” connected to them, which control the blade tips. The lightning is transmitted to the bearing ring via slip-rings and air gaps on the main shaft. From there, the over-voltage is led off to the tower and finally into the ground via foundation earth electrodes and deep earth electrodes.

Remote Data Monitoring

All the operational data for the wind turbine can be retrieved over optical fiber. The remote data monitoring software is supplied when the wind turbine is erected. Some of the most important operational data that can be retrieved via remote data transmission are mentioned below:
Instantaneous electrical power of generator
Rotor and generator rotational speed Gearbox and bearing temperatures
Hydraulic pressures (pitch adjustment of the blade tips, disk brake, etc.)
Azimuth angle
Instantaneous wind speed and direction
Statistics: -daily, monthly and annual energy production figures-fault statistics and many other faults can be detected and eliminated using these operational data.