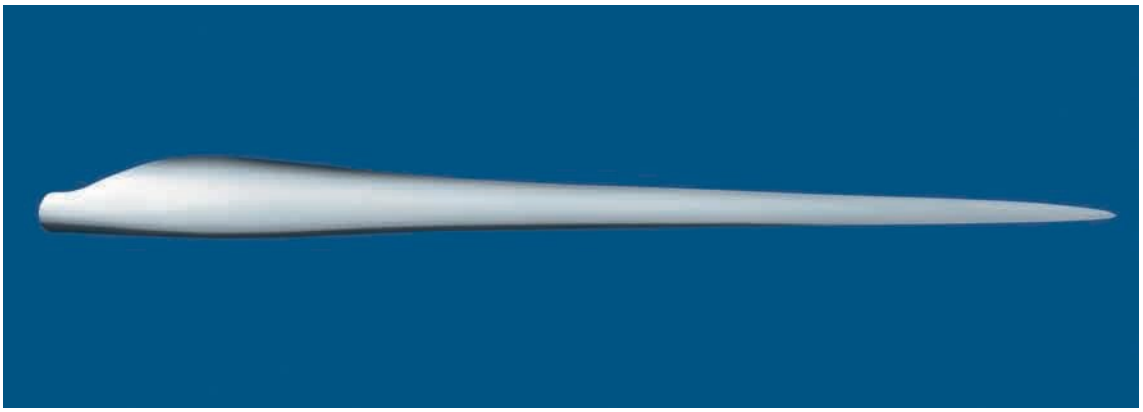
V90-1,8 MW
V90-2,0 MW

Constructed over the base of experience

Vestas®

No. 1 in Modern Energy



Innovetion in the technology of blades

Maximum efficiency

Generators OptiSpeed®* of V90-1,8 MW and del V90-2,0 MW are an adaptation of the installed in one of the wind energy turbines of the greatest success Vestas, el V80. OptiSpeed® represents a significant advance in the performance of wind turbines, because it enables a variation of approximately a 60% of the turn speed of the rotor with respect to the nominal speed. This means that with OptiSpeed®, the rotor speed may vary up to a 30% above or below the synchronous speed. Its objective is simple: maximize energy production

To obtain this objective, it gets profit of the best performanceo of the low and variable rotation , it stores the surplus of energy in a rotatory way and explodes all the force of momentary spells. As a result, OptiSpeed® increases the annual production of energy..

As an additional benefit, OptiSpeed® also reduces the tensions in the multiplier, in the blades and the tower thanks to minor peaks of charge. Besides, since the noise id generated by a wind turbine it depends on wind speed, minor rotation speeds enable OptiSpeed® to reduce naturally the noise levels

Finally, OptiSpeed® helps our wind turbines V90 to supply energy of the best quality to the net, with a rapid synchronization, a reduced harmonic distortion and less fluctuations

3×44 meters of forefront technology

Vestas blades have always been among the lightest in the world and with the wind turbines V90 we have leveled up. The new blades incorporate various new lighter materials, mainly carbon fiber in the poles which support the load. Carbon fiber not only is lighter than glass fiber in previous blades, but in their stronger force and rigidity have been made possible to reduce the quantity of material needed This means that, even though our V90 have 27% more of the swept area than V80, longer blades weigh approximately the same.

V90 blades present a new profile aerodynamically superior to the previous generation Vestas Engineers developed this profile technologically advenced through the improvement of the relation between the global impact of the charge of the wind turbine and the energy annually generated. The result of their work has been a new form of plan and a new curved back edge.

The resulting aerodynamic plan improves energy production, and makes the blade profile less sensible to dirtiness in the attack edge and maintains a good geometrical relation between the thickness in an aerodynamic plan and the following. In the wind turbine V90 this is translated in an increase in the combined production with a reduction in charge transferences, thus in a general improvement.

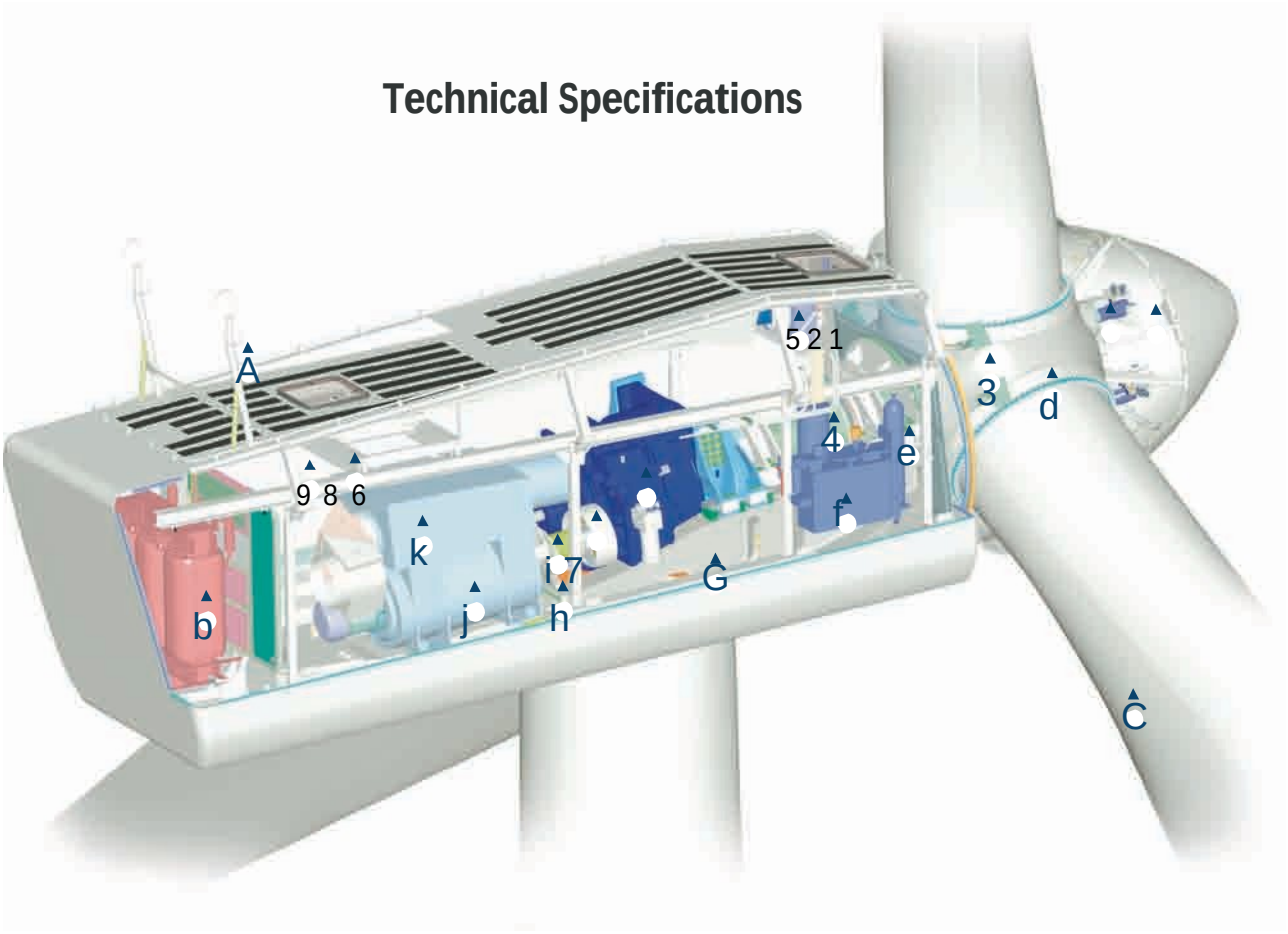
Demonstrated performance

Wind Energy parks require great investments and the process may be very complicated. To ease the process of evaluation and purchase, Vestas has identified three decisive factors that determine the quality of wind turbine: the energetic production, the energetic quality and noise levels.

We passed several months testing and documenting the performance of our wind turbines. Once fully satisfied, we make a final com probation through an independent organization that verifies the results. This is normal practice in Vestas, a procedure that we call Proven Performance In Vestas we do not only speak of quality We demonstrate it with facts.

** OptiSpeed® de Vestas no está disponible en EE. UU. ni Canadá.*

Technical Specifications



1 **Hub controller**

2 **Cylinder of flow control**

3 **Hub**

4 **Principal Axis**

5 **Oil cooler**

6 **Multiplier**

7 **Brake of prolonged stop**

8 **Maintenance crane**

9 **Controller VMP-Top with converter**

a Ultrasonic sensors

b High tension transformer

c Blades

d Blade bearing

e Rotor Block System

f Hydraulic unit

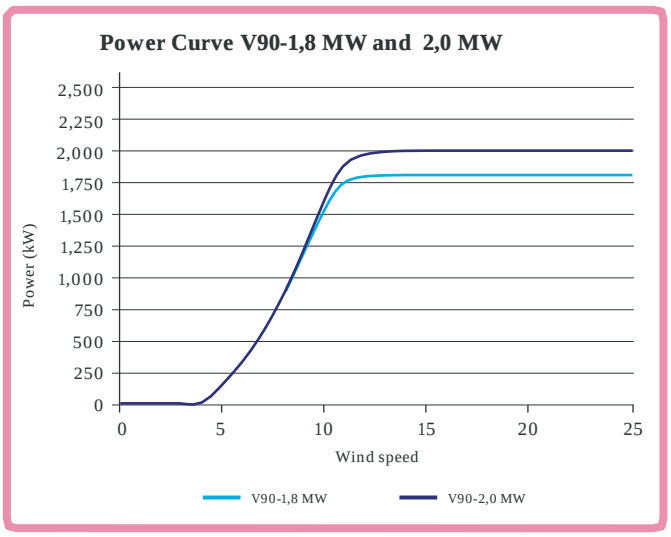
g **Chasis**

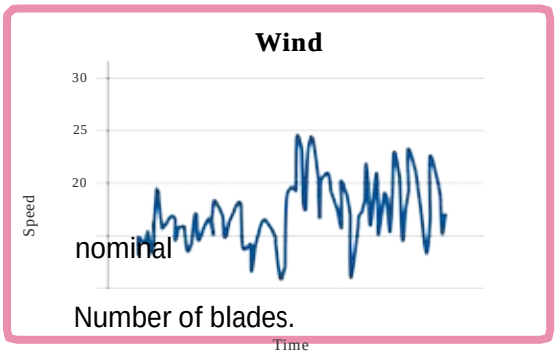
h Orientation system

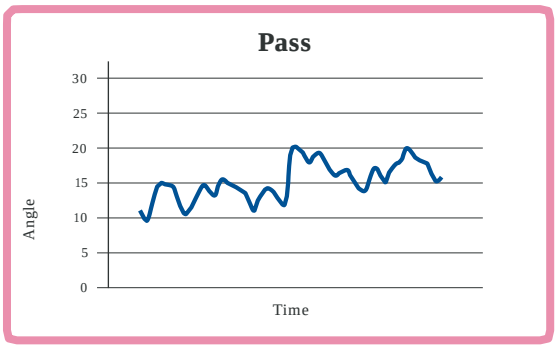
i Coupling

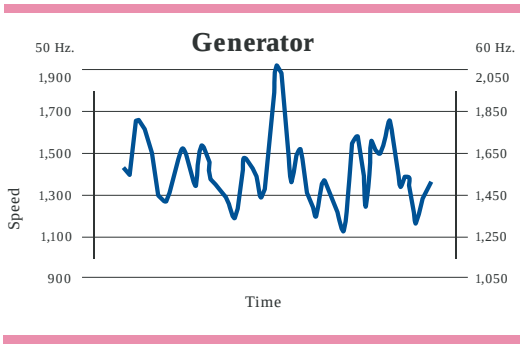
j **OptiSpeed®**

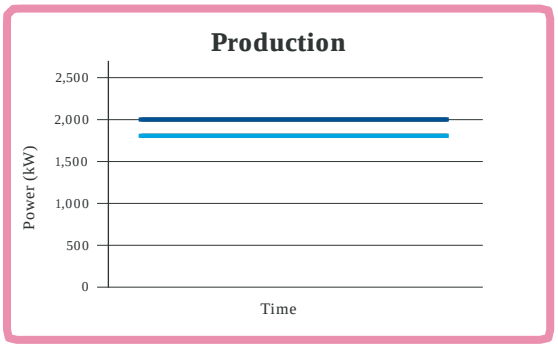
k Air cooler for the generator











OptiSpeed® permite una variación de las velocidades de giro del rotor de un 60% aproximadamente en relación con la velocidad nominal. Así, con OptiSpeed®, la velocidad del rotor puede variar hasta un 30% por encima o por debajo de la velocidad sincrónica. Esto reduce las fluctuaciones no deseadas en la producción suministrada a la red eléctrica y minimiza las cargas en las partes esenciales del aerogenerador.

Rotor

Diameter.	90 m
Swept area.	6.362 m².
Turn Speed	14,9 rpm
operative interval	9,0-14,9 rpm
3	
Power Regulation:	Pass/OptiSpeed®
Pneumatic Brake	Three hydraulic cylinders of pass independent

Tower.

Hub height.	80 m, 95 m, 105 m

Operative Data

	Date	IEC IIIA/DIBt II:
	1,800 kW/2,000 kW.	
Star speed 3,5 m/s		2,5 m/s
Speed of nominal wind	12 m/s	13 m/s
Speed of cut	25 m/s	25 m / 21 m.

Generator

	Date:	IEC IIIA/DIBt II:
Type.	Optispeed with asynchronous	Optispeed with asynchronous
Nominal Production	1.800 kW	2.000 kW
Operative Data	50 Hz/60 Hz 690 V	50 Hz/60 Hz 690 V

Multiplier

Type.	Planetary axis/helical

Control

Type.	Control based in mycroprocessor of all the functions for the wind turbine with option of remote supervision.
	Optimization and regulation through OptiSpeed and regulation of pass OptiTip

Weight

Nacelle	68 t.
Rotor	38 t.

Tower.

Hub height.	IEC IIA	IEC IIIA	DIBt II
80 m	150 t	150 t	-
95 m	200 t	-	200 t
105 m	-	-	225 t

t = toneladas métricas

Las torres DIBt sólo han sido aprobadas en Alemania.

Todas las especificaciones están sujetas a modificaciones sin preaviso.

Constructed over the base of experience

Most advanced Wind turbines are not developed from nothing To create the new V90-1,8 MW and V90-2,0 MW for medium and low intensity winds we have resorted to a our vast experience acquired as the first provider of wind energy systems in the world. Plainly, we have applied designs with success in our products

We started with nacelles of our most proved wind turbines V80 that incorporate technology OptiSpeed to achieve maximum productivity. Then we added new and revolutionary blades V90-30 MW for high density winds. We show you the components to ensure an optimal harmonization and benefit from the conditions of final placement

The resulting Wind turbines V90-1,8/2,0 MW have been improved for its installation in areas of scarce turbulence and low to medium intensity This new wind turbines are so efficient that can generate 25% more of energy than V80.

Naturally, the new integrated wind turbines incorporate innovations For example, Vestas engineers dedicated two years to the job of designing a more efficient and solid multiplier Besides, even though the 90 m rotor weighs approximately the same as the rotor of v80, longer blades imply bigger charges, so we have reinforced the transmission and other important components of the V90.

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