風 力 發 電 專 用 軸 承

潔淨的能源是追求工業發展與保護生活環境兩者兼顧所追求的目標之一,風力發電是近世紀以來除太陽能發電及地熱發電與潮汐發電之外的另一選項,用取之于自然的生生不息能量,轉化成可供各種民生工業使用的電力,又能減低對環境污染的衝擊,也是目前政府所致力開發的能源。
風力發電機主要由塔架、葉片、發電機等三大部分所構成,而其內部所使用之轉動軸承亦是主要配件,信諾工業本於多年來對於大型軸承專精的技術,結合各協力廠家之研發能量,開發製造高品質且耐用之風力發電機專用軸承,期能對環境保護有所貢獻。

Special bearings for wind power generation

Clean energy is one of the solutions when consideration must be given to both industrial development and environmental protection. By physical methods transferring the endless nature energy into electricity without impacting the environment, it is the very way that most governments commit to develop. Wind power generation is an option other than solar power, geothermal power and tidal power generation in these years.

A wind power generator is composed by three major parts, Tower, Blades and Primary generator. All these major parts need various special bearings to achieve their performances. Based on our experiences of large bearings and combined R&Ds with our alliances, Sino Precision is developing and manufacturing high quality and durable special bearings for wind power generators.

Better environment is something that we concern too.

風電軸承之種類：

風力發電機軸承通常包含偏航軸承、變槳軸承、傳動系統軸承(主軸和變速箱軸承)目前信諾工業為客戶提供的是偏航軸承和變槳軸承，每台風力發電機用一套偏航軸承和三套變槳軸承。
1.偏航軸承安裝在塔架與座艙的連接部,一般採用四點接觸球轉盤軸承或交叉圓柱滾子轉盤軸承。
2.變槳軸承安裝在每個葉片的根部與輪轂連接部位，一般採用單排或雙排四點接觸球轉盤軸承。

Kinds of special bearings for wind power generator

Usually, there are three kinds of special bearings, a yaw bearing, three pitch bearings and a set of transmission bearings (spindle and gearbox bearings) in a typical wind power generator. Sino Precision supplies yaw bearings and pitch bearings.

1. A yaw bearing is applied at the joint between the tower and the cockpit of the generator. Four contacting points slewing bearing and cylindrical crossed rollers slewing bearing usually are the candidates of yaw bearing.

2. A pitch bearing is applied at the joint between each blade and the hub. Single row and double rows four contacting points slewing bearing usually are the candidates of pitch bearing.

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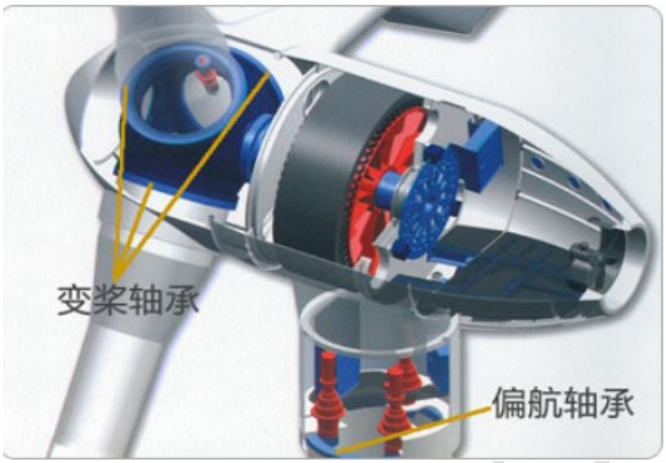
風電軸承之設計：

風力發電機的使用壽命通常不低於 20 年，維修保養成本非常高，這就要求偏航軸承和變槳軸承的壽命也不能低於 20 年。考慮到偏航、變槳軸承工作時受力情況複雜，軸承承受的衝擊和振動比較大，因此要求軸承既能承受衝擊，又能承受較大載荷，這就對材料的機械性能有非常高的要求。套圈的材料選用 42CrMo，熱處理採用整體調質處理，套圈基體硬度達到 240-280HB，滾道表面淬火，硬度達到 55-62HRC，既能夠承受衝擊而不發生塑性變形，同時增加接觸疲勞壽命，從而保證軸承 20 年使用壽命的要求。
由於工作狀態下小齒輪和軸承齒圈之間有衝擊，齒圈的齒面要淬火。 在低溫衝擊功方面，—20℃ Akv 不小於 27J，也可與用戶協商確定該要求。



風力軸承示意圖

風力軸承試驗機

Schematic illustration of wind power generator and its bearings
Experiment machine for the special bearings

The concept of designing a special bearing for wind power generator

Generally, the life span of a wind power generator is not less than 20 years and its maintenance cost is not cheap. Thus, the service life of those special bearings for the generator is required for 20 years at least as well. But the working conditions of those special bearings are quite complicated when driven by wind. The bearings have to withstand both high impact and vibration very frequently. Therefore, a material with very high mechanical strength is required for these bearings, where alloy 42CrMo is adopted for the bearing ring. The hardness of the bearing ring is increased to 240 – 280 HB by integrate quenching and tempering treatment and the hardness of its race way is even improved to 55 – 62 HRC by particular surface quenching to ensure the impact deformation and the contacting fatigue will not occur during the required service life.

There are impacts as well in between gear and the gear of bearing ring. Thus a particular surface quenching is required on the gear of the bearing ring to ensure the low temperature impact resistance not less than 27J under —20℃ Akv. And this property is negotiable with customers.

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風電軸承之防潮處理：

由於風力發電機設備在野外工作，而且偏航、變槳軸承的一部分是裸露在外面的，會受到大氣污染，高濕度的環境也會腐蝕軸承基體，因此裸露在外面的偏航和變槳軸承的部位要求進行表面防腐處理。一般採用熱噴塗鍍鋅處理(不採用高污染之電鍍)根據需要在鍍鋅層外部再進行刷漆保護處理。
對於遊隙，變槳軸承的衝擊載荷比較大，風吹到葉片上震動也大，所以要求變槳軸承的遊隙應為稍微的負遊隙值，這樣在震動的情況下可減小軸承的微動磨損。在密封條的選用上，通常採用德國 Simrit 品牌，專用於風電軸承方面，其主要特點是耐低溫，抗腐蝕及耐磨性好，使用壽命長。

風力發電機

Special bearings and wind power generator

Moisture-proof treatment for the special bearings

Wind power generators may be polluted by air when they work at wildness where they usually are located. Their yaw bearing and pitch bearings are opened to the air and may be polluted as well. A high humidity environment will corrode the bearings too. Therefore, a particular anti-corrosion surface treatment is applied on the bearings. Instead of applying high environmental pollution zinc plating, we adopt thermal spraying galvanized treatment. There even is an additional special painting treatment on the bearings' external layer if necessary.

The clearance of pitch bearings is set to negative slightly to reduce the fretting wear in order to withstand high impacts and high vibrations on blades cause by wind. A specialized seals for wind power generator made by Germanic Simrit (C.F.W.)® are adopted on our bearings. These seals are low temperature resistance, corrosion resistance and wear resistance, and heavy duration.

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