GH-50KW

GREEF 50kW Wind Turbine

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1. Technical characteristics

Unit type: high-speed permanent magnet wind turbine

Pitch control system: active pitch control.

Yaw system:active yaw

Full power inverter system;

High and low pressure crossing;

SCADA remote monitoring system: remote management, monitoring and maintenance;

Smart fan: real-time online monitoring fan; Online optimization and upgrade;

Professional Functionalization and Customization of Units :[DC or AC of microgrids such as islands, cold and polar regions]

Customized design of multi-application scenarios: [industrial parks, factories and mines, beautiful countryside, etc.]

Customized color

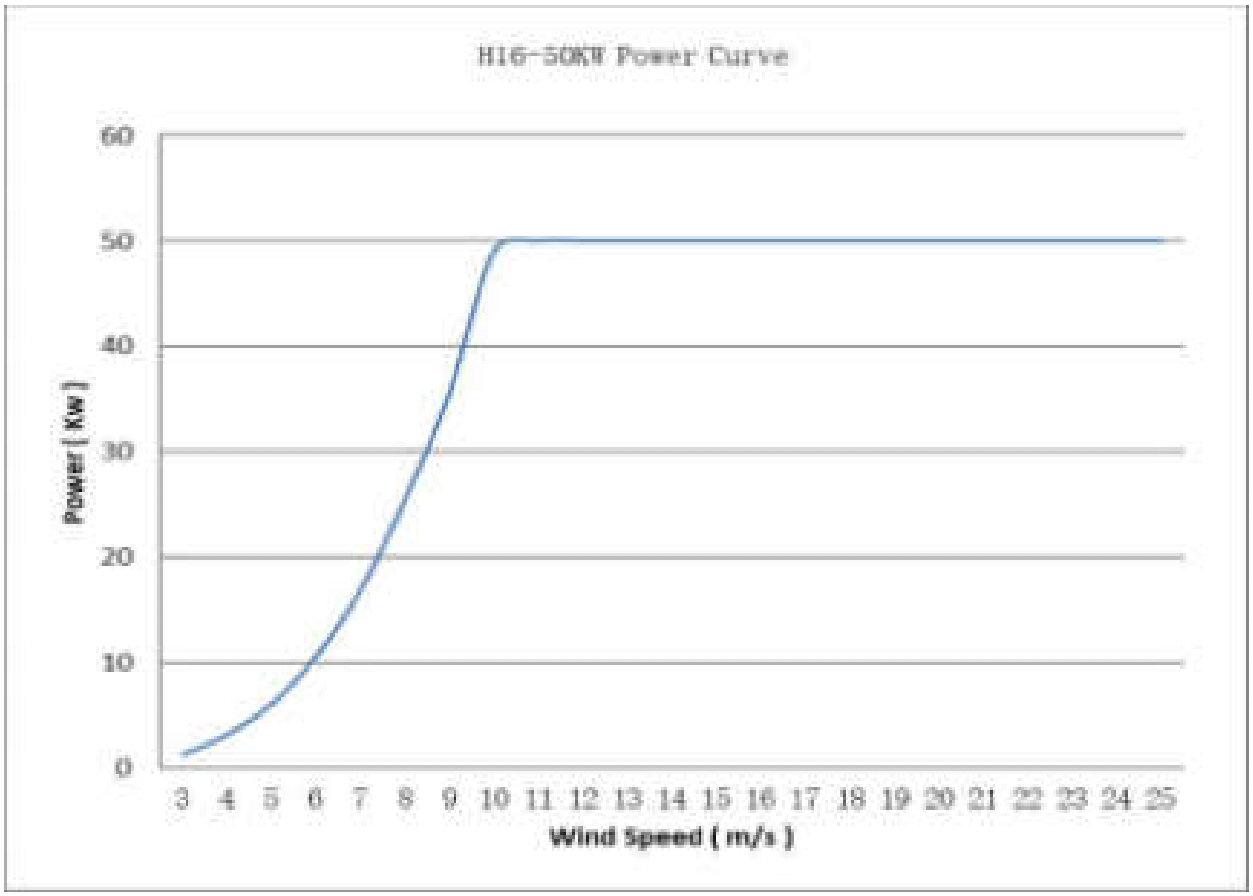
2. Technical parameters

2.1 parameter list

Serial Nr	Describe in detail	unit	Rule Style
1	**Machine Group (design standard IEC 61400-2)**		
1.2	Rated power	kW	50
1.3	Maximum power	kW	55
1.4	Cut-in wind speed	m/s	3
1.5	Rated wind speed	m/s	10
1.6	Cut wind speed	m/s	25
1.7	Anti-maximum wind speed (3s average)	m/s	59.5
1.8	Design service life	year	20
1.9	Operating ambient	℃	-30℃~45℃
2	**Wind wheel**		
2.1	Wind wheel diameter	m	17
2.2	Sweep area	m^2	226
2.3	Speed range	rpm	50-85
2.4	Rated speed of wind wheel	rpm	75
2.5	Direction of rotation		The wind direction on the horizontal axis is lockwise.
2.6	Angle of pitch	°	4
2.7	Cone angle of wind wheel	°	0
2.8	Number of blades	p	3
2.9	Blade length	m	8.0
2.10	Blade material		Glass fiber reinforced polyester/epoxy resin
3	**Gear Case**		
3.1	Gear box type		Two-stage parallel helical gear
3.2	Gearbox transmission ratio		20:1
3.3	Transmission efficiency	%	≥97
3.4	Rated power	kW	87
3.5	Lubrication form		splash lubrication
4	**Generator**		
4.1	Type		High-speed permanent magnet generator
4.2	Rated power	Kw	50
4.3	Rated voltage	V	380
4.4	Rated frequency	Hz	50
4.5	Rated speed	rpm	1500
4.6	Insulation grade		F
4.7	Protection grades		IP54
5	**Brake system**		
5.1	Service brake system		Active pitch control
5.2	Second braking system		Clamp disc brake

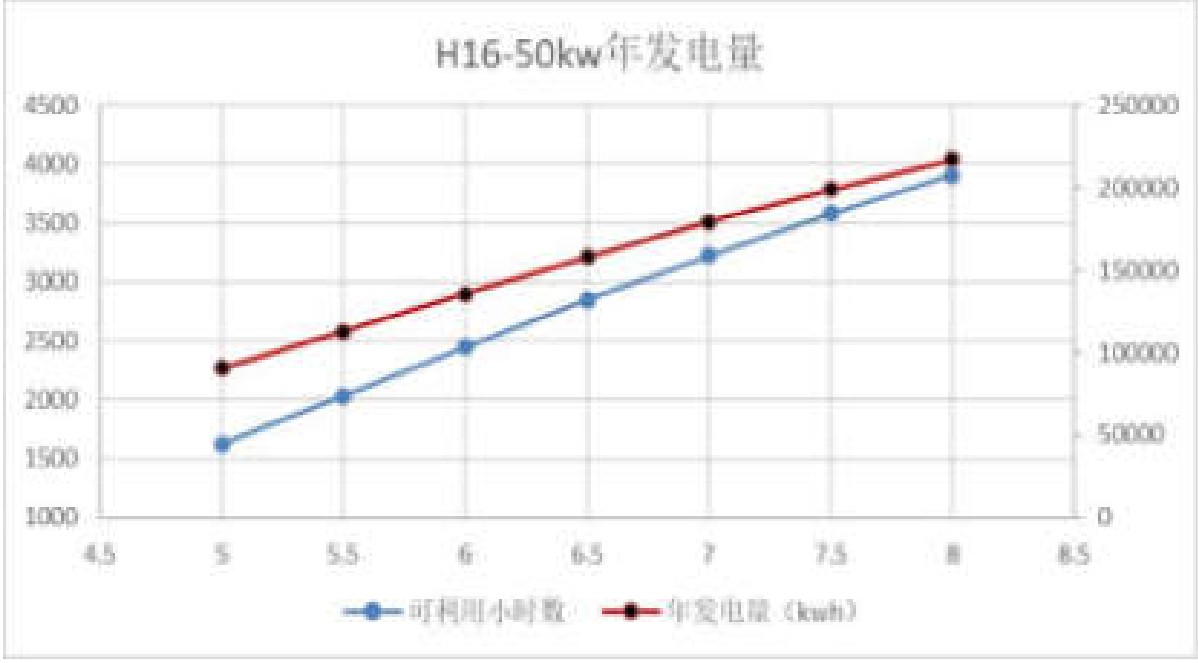
6	**Yaw system**		
6.1	Type		Active yaw
6.2	Yaw drive		1 drive motor
6.3	Yaw brake		Sliding shoe damping brake
7	**Control System**		
7.1	Type		PLC
7.2	Surveillance center		Remote monitoring
8	**Lightning protection**		
8.1	Design standard		IEC61024/61312/61400，GB50057-1994
8.2	Measures		Tip lightning protection
9	**Tower**		
9.1	Type		Tubular conical steel tower
9.2	Height	m	20-24
9.3	Rope ladder		Internally installed
9.4	Tier number		2-3
9.6	Texture ofwood		Q345
10	**Base Plinth**		Anchor bolt type
11	Noise	db	≤56

2.2 Unit Power Curve



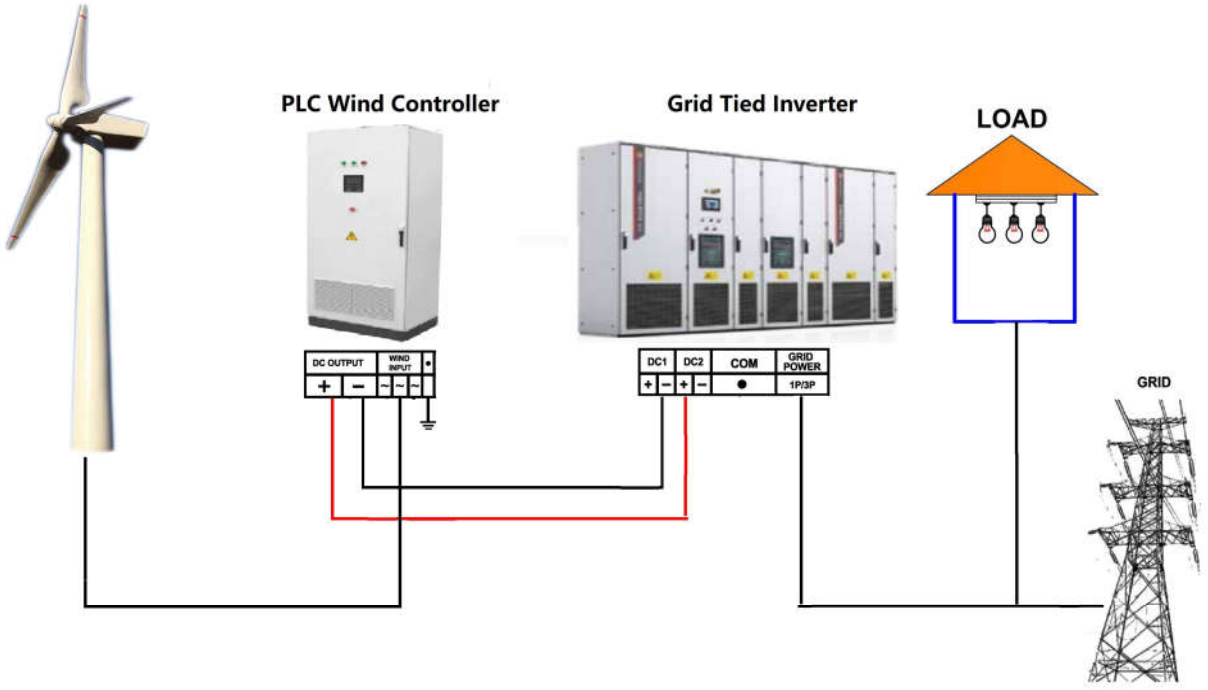
wind speed (m/s)	3	4	5	6	7	8	9	10	11
ppower (kw)	1.34	3.17	6.18	10.68	16.96	25.32	36.05	49.46	50

2.3 Annual Power Generation Curve



Wind speed (m/s)	Available hours	Annual power generation (kWh)
5.0	1628	90454.69
5.5	2036	113138.44
6.0	2447	135938.54
6.5	2846	158135.77
7.0	3226	179246.11
7.5	3582	198972.51
8	3909	217145.1

3. Schematic Diagram of Grid Tied System



4. Control Strategy

The control system has a hardware circuit safety chain protection device, and the software design also adopts multi-layer protection measures. The protection link is designed based on the principle of failure protection. When the unit fails to operate normally due to the influence of internal or external faults, the system safety protection device acts to protect the fan in a safe state. The system automatically performs the protection function under the following conditions: overspeed, generator overload, excessive vibration, power grid or load loss, heavy storm weather, etc.

System startup:

About 5 minutes after the system is powered on, the system self-check is completed. At this time, if the Fault light on the control cabinet door is on, the "State" on the system operation screen shows "general fault" or other faults. When all systems are checked to be normal, press the "Reset" button on the control cabinet door to reset the systems, and the "Fault" indicator goes off, and the "State" shows "Normal", indicating that the systems are in a normal state. At this time, if you receive the startup command from the superior, the system will start to run automatically; If the wind speed reaches the cut-in wind speed of the system, the "Run" indicator on the control cabinet lights up and the system starts to run automatically.

System shutdown:

Small wind shutdown:

When the unit operates normally and the wind speed is less than the set shutdown wind speed, the system will enter the standby state, and when the wind speed reaches the cut-in wind speed, the unit will automatically start to operate;

Windy shutdown:

When the unit runs normally and the wind speed is greater than the maximum wind speed set by the unit, the system will enter the shutdown protection state, and the wind speed meets the restart wind speed, and the fan can be automatically started again;

Shutdown:

When the unit is running normally, you can press the "Stop" button on the operation panel to stop it. At this time, the system enters the stop state, and you need to press the "Start" button to restart the unit.

Emergency stop:

When it is found that the unit is working abnormally and needs to be stopped immediately,

you can press the "emergency stop" button or the "emergency stop" button on the operation screen for emergency stop.

The system stops urgently, and needs to be reset when restarting the unit; It should be noted that if it is not in a very urgent state, you can press the "Stop" button without pressing the "Emergency Stop" button, and the fan can stop immediately.

Fault shutdown:

When the unit is in normal operation, if the system fails, the unit will automatically stop, and when it enters the fault state, it needs maintenance personnel to remove the fault and then reset and start; Please refer to "Faults and Handling" for detailed faults and handling methods.

System maintenance:

If it is necessary to maintain the unit, turn the tower foundation cabinet changeover switch to the maintenance State without power failure, and the "State" displays "Maintenance" and the brake locks.

Brake system:

The braking system is mainly used to brake the fan when the fan is maintained or there is a major fault, which can improve the reliability of the wind turbine and protect the safety of the operators.

Yaw system:

Yaw system is a system which is controlled by the wind turbine control system and operated electrically according to the wind vane and anemometer signals installed at the top outside the engine room. Under normal circumstances, the yaw system automatically completes the yaw, and the yaw can also be manually operated. The wind generator can face the wind accurately, thus improving the power generation efficiency.

Variable distance system:

The pitch control system is a pitch control system, and the pitch control mode of blades is full-span synchronous electric pitch control, which is controlled by the wind turbine control system and operated by electric push rod. The maximum speed of blade pitch change is 9 degrees per second, and the pitch change angle is.0 ~ 90 degrees.

Monitoring system:

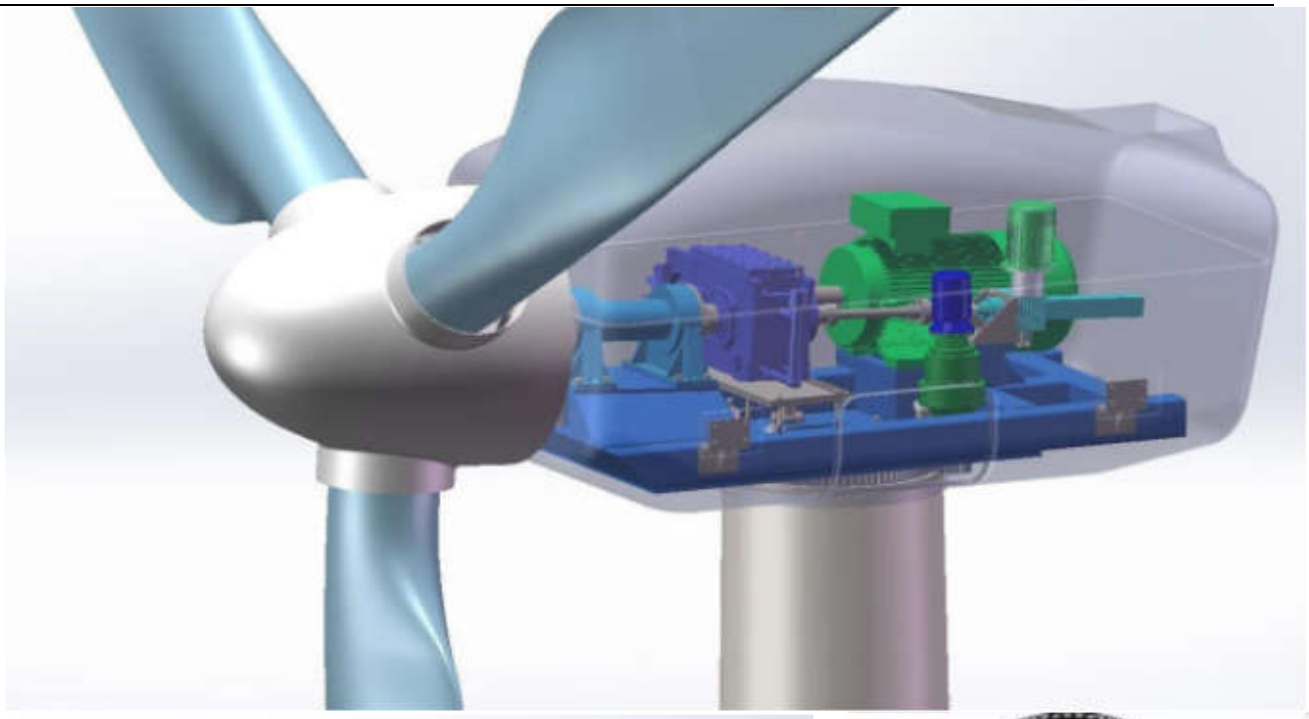
The wind turbine adopts a 10-inch touch screen to monitor the wind turbine in real time, monitoring the wind speed, wind direction, voltage, power, yaw position, engine room position, temperature of various parts, faults and other data of the wind turbine, and can be manually operated.

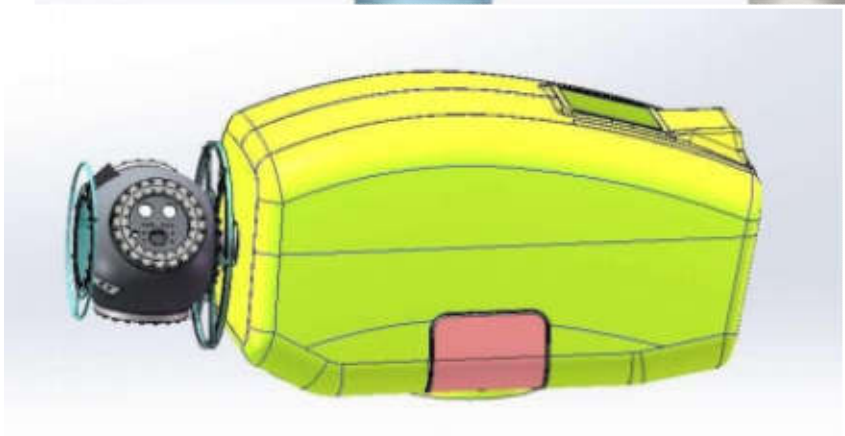
The fan provides open communication protocol to realize remote communication control with the upper computer, and the unit is monitored through centralized monitoring system, and our company also provides centralized monitoring system for customers to use

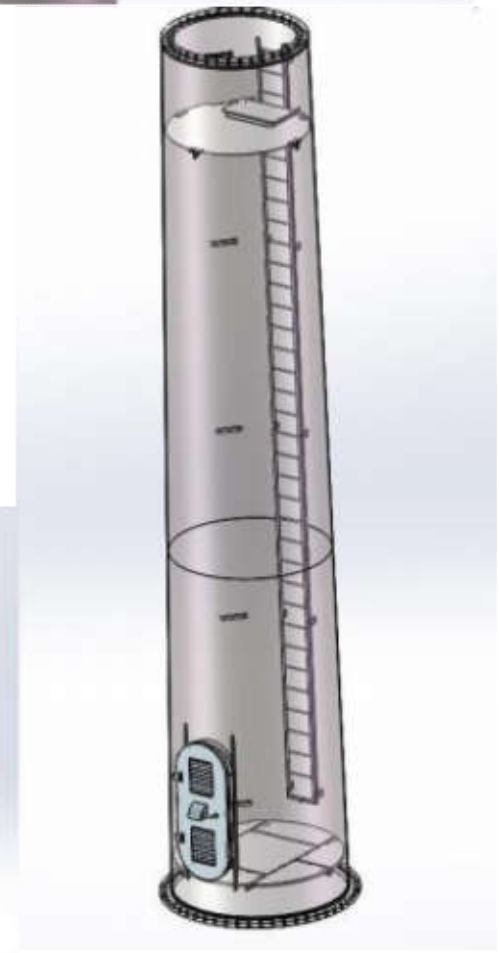
SCADA control page

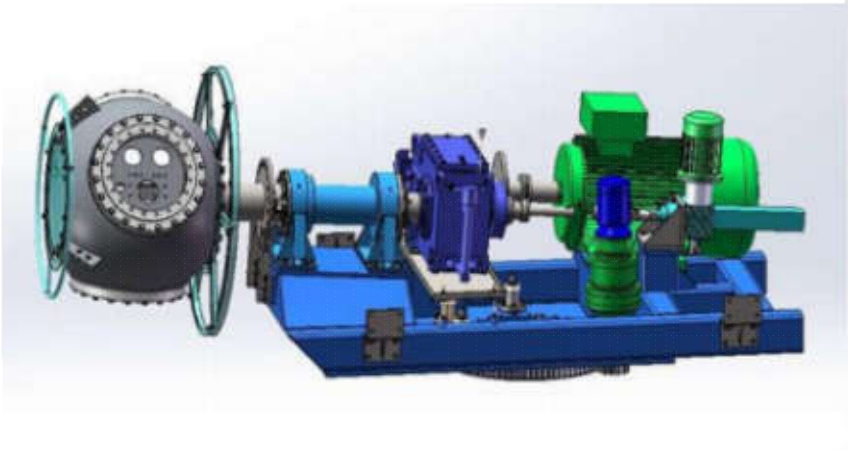
5. Schematic diagram of wind turbine structure

5.1 Schematic diagram of overall structure









6. The unit and tower anti-corrosion

6.1 Corrosive environment

During the service period of the tower, some anti-corrosion protection measures should be taken to avoid the corrosion damage of the steel structure caused by the atmosphere, water and salt. The corrosion of steel structures is closely related to the environment. According to ISO 12944-1998,Corrosion Protection of Steel Structures by Color Paint and Varnish Protective Coating Systems":

Corrosion Classification		Typical of mild climates	
		external	inside
C3	medium	Urban and industrial atmosphere, low salinity coastal areas	Places with high humidity and air pollution
C4	tall	Industrial areas and coastal areas with high salinity	Chemical plants, swimming pools, ships and shipyards, etc.
C5-1	Very high (industrial)	Industrial areas with high salinity and harsh atmosphere	There are always buildings with condensation and high humidity.
C5-	Very high (marine)	Coastal and offshore areas with high	Buildings or other places that are always in

6.2 Specific anti-corrosion measures

Technical Description of Tower

In the overall arrangement of the whole machine, the position where the center of gravity of the engine room moves forward should make the overturning moment of the front pressure of the wind wheel on the yaw revolution surface and the eccentric moment of the center of the engine room on the tower center partially offset. In this way, under the rated wind speed, the eccentric moment borne by the tower can be reduced to ensure the stability of the whole machine operation.

The tower is conical and tubular, and is welded by quality-guaranteed steel plates. The tower itself is 50m high and the hub is 51.49m high. The tower is manufactured in three sections, and all the welding is automatic powder welding, which requires ultrasonic and X-ray testing.

Inspect the welding seam of the tower. And each section of the tower must accept the inspection certificate provided by the quality supervision department or research institute. There is a door with a lock at the entrance of the tower. The tower is designed with a platform, lighting and climbing system for rest. There is a ladder at the bottom of the tower to log into the engine room, which is convenient for transporting maintenance personnel and materials up and down.

The design requires that the bending natural frequency of the tower be staggered from the rotating frequency of the wind wheel, the frequency of the blade passing through the tower and the bending natural frequency of the blade, and it should not be an integer multiple of the above frequencies.

Ladder: Fig.5transportationoftowersleeveandinstalationoftower.

The ladder is of welded structure and equipped with a rest platform. The ladder is installed at a certain distance from the tower wall and backed by the tower wall. Such a ladder can replace the seat belt. The entrance and working conditions conform to the regulations on workers' safety management in China.

Platform:

A maintenance platform is installed at the connecting flange of each tower and at the top of the tower for checking and tightening bolts, and the platform is connected to the tower by bolts. When maintaining and checking the bolt torque and yaw system, the top of the platform provides enough space and the height of the station when maintaining.

Lighting:

There are lighting lamps under each platform. Moreover, all the lighting lamps can be turned on and off through the switch on the control panel at the bottom of the tower. Engine room lighting and socket with plug voltage of 220v. Some lights can also work in emergency lighting, that is, they will automatically.

In the case of power failure, the ground will be powered continuously for 15 minutes through the uninterruptible power supply to ensure that there is enough brightness for people to evacuate from the wind turbine and to automatically turn on the lights when climbing down.

Protection:

The surface of the tower is properly protected by sandblasting and anti-corrosion protection by multi-layer spraying. The color of the tower is white, similar to the color of blades and nacelle cover.

7. Foundations

7.1 Overview of wind turbine foundation

a) The foundation of wind turbine adopts gravity cast-in-place reinforced concrete octagonal or polygonal foundation with inscribed circle diameter. 6m, and the buried depth of foundation is 3m.

b) The design level of wind turbine foundation is Grade 3, the structural design service life is 50 years.

c) Engineering concrete pouring process is complex, so the construction unit needs to carry out construction organization design in advance and report it to the owner and supervisor for approval.

7.2 Construction process of wind turbine foundation

The main technological process of wind turbine foundation construction is as follows: excavation of foundation pit → construction of →C15 concrete cushion → preparation of pouring warehouse surface (formwork erection, bottom reinforcement binding, pipe burying, erection of upper reinforcement, etc.) → quality inspection and acceptance of warehouse surface → concrete batching → concrete mixing → truck transportation → concrete warehousing → vibration closing → maintenance → form work removal → quality inspection → defect repair → earthwork back filling.

7.3 Acceptance standard of tower foundation ring

Four groups of adjusting bolts are used for the foundation ring to ensure the installation level of the tower foundation ring, and the adjusting bolts are supported on the foundation cushion. The construction Technical requirements should be followed during the installation of the foundation ring. After the foundation pouring is completed, the flatness of the flange on the tower foundation ring shall be inspected and accepted, and the levelness deviation shall be less than 2mm.

7.4 Environmental protection and safety

During the construction of wind turbine foundation, we should follow the Green Construction Guidelines issued by the Ministry of Construction (J.Q. [2007] No.223), relevant environmental protection laws and regulations and the requirements of local environmental protection departments, and at the same time, we should standardize civilized construction to ensure construction safety.