

## **Standard Reconditioning Schedule Wind Turbines**

1.
  - a. Tower:
    - i. Tower is inspected and where necessary repairs will be made inside and outside tower;
      1. Inspection of security lines and connections,
      2. Inspection of outside steps, correct bended steps.
      3. Inspection of tower connection box, add new main twist cable. Replace tower connection box where necessary.
  - b. Nacelle:
    - i. Chassis;
      1. Physical inspection of chassis and bolt connections, remove oxidation where necessary.
      2. Physical inspection of subchassis, apply new layer of primer and paint against corrosion.
      3. Optical and Physical inspection of rubber mountings of subchassis for anti-vibrating system
      4. Attach a new layer of paint on the hood of the nacelle if necessary
    - ii. Yawing system;
      1. Physical and optical inspection of main cogwheel on wear, where necessary smoothed teeth to assure less wear during operation
      2. Opening of complete main cogwheel for cleaning and inspection of bearing, clean and inject new grease, complete new separator for ball bearings installed including dust protection.
      3. Complete overhaul of yawing gearbox, all bearings replace, flexible connection inspection and adjustment.
      4. Inspection and new insulation (thermical injection under high pressure) add to the yawing engine
      5. Fill with new gearbox oil as prescribed by manufacturer.
      6. Inspect and check for proper operation of the cable twist system.
    - iii. Generator;
      1. Complete overhauling of generator, new bearings, windings cleaning and insulation attached (thermical injection under high pressure)
      2. Check for resistance of windings and check for proper operation
      3. Flexible connection of generator inspect and renew.
      4. Greased bearings as prescribed by manufacturer.
    - iv. Main gearbox;
      1. Completely overhaul gearbox, place new bearings where necessary.

2. Optical and Physical check of all cogwheels on wear and where necessary corrected. Cogwheels and axes are mounted with specifications as prescribed by Manufacturer.
  3. Main axle check for haircracks with use of Dye-spray.
  4. Physical and optical check of gearbox brake system for correct operation.
  5. Resistance of (oil filled) gearbox to be adjusted assuring a proper operation at low windspeeds.
  6. Physical and optical check on 'back-run' brake system, 1 replace with new brake.
  7. Fill with new Castrol gearbox oil as prescribed by Manufacturer.
  8. All closing parts of gearbox to be smoothed to assure a leak free operation.
- v. Rotor;
1. To be overhauled completely
    - a. 2 New main bearings to be placed at each blade axle
    - b. New teflon bearings placed at each centrifugal axle where necessary
    - c. Shock absorbers tested for proper operation
    - d. Springs adjusted to dimensions as specified by Manufacturer
    - e. Blade angle system to be completely adjusted to factory settings, blade angles to be adjusted to 6,7 degrees
    - f. All covers to be checked for leakage or holes
    - g. Rotor to be balanced as specified by manufacturer with blades attached and numbered (under clinical conditions)
    - h. Rotor to be physically tested for proper operation of blade angle system and blade angle brake system
- Note: During first 500 hrs of operation final power adjustments need to be made to the rotor blade system (>12m/sec) by adjusting the blade angle controller system.**
- vi. Blades;
1. To be cleaned completely, repaired and repainted
    - a. Holes to be repaired where necessary
    - b. Optical inspection of complete outer surface
    - c. Attached an anti corrosion layer for protection with 2-component paint
    - d. Attach a wear protection at the 'fly' side of the blades
- c. Control housing, chassis housing and connection points and instruments
- i. Main control housing
    1. Physical and optical inspection and prepare for 'Full Variable Operation'
      - a. Cleaning for dust
      - b. All connection points to be checked and cleaned from any corrosion
      - c. All relays to be checked for proper operation and cleaned for oxidation
      - d. All fuses to be checked and replaced if necessary

- e. All capacitors check for proper operation
  - f. All transformers to be inspected and checked for resistance and proper operation
  - g. Mutator to be checked for proper operation
    - i. Diodes to be checked and replaced where necessary and diodes to be replaced where necessary
    - ii. Thyristors to be checked
    - iii. Mutator print check
    - iv. Cooling system to be checked
  - h. Transducer to be checked and adjusted to 2V between 11-12 (0 KW zero point)
  - i. PLC to be inspected and check for proper operation
    - i. Latest software in Eeproms to be loaded if necessary.
- ii. Chassis housing
- 1. Physical and optical inspection
    - a. To be cleaned for dust
    - b. All connection points to be checked and cleaned from any corrosion
    - c. PLC to be inspected and checked for proper operation
  - 2. Instruments
    - a. Wind vane to be checked for proper operation, bearing to be replaced (needs final adjusting during installing the wind turbine)
    - b. Anemometer to be checked for proper operation
    - c. Imbalance switch to be checked for proper operation
    - d. Rotations sensor to be checked for proper operation
    - e. Cable twist system to be checked for proper operation