



Evaluation of HALUS Power systems

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Introduction

The following explains the findings an initial visit to HALUS power systems San Lorenzo California on the 28th and 29th of October 2010 where the remanufacture of wind turbines is carried out.

The turbine was originally a Vestas machine but it has been proposed that within Europe this machine could possibly be re-branded as a HALUS machine to distinguish it between the reconditioned and remanufactured.

The subsequent models of machine have been selected to be suitable for the sale within Europe using the 50HZ system:

- V17 (75kW)
- V20 (100kW)
- V27 (225kW)
- V29 (225kW)
- V39 (500kW)

There are other models with the HALUS portfolio but these machines are recommended.

Remanufacturing Process

Towers

The remanufacture sees the original towers from the turbines be completely sanded down and re painted.



The tower options are:

24m towers with two sections (V17 & V20)

There is an option to get a third section created to allow the turbine to be situated on a 30m tower detailed drawings can be obtained from HALUS to create this extension in the UK.

30m towers with three sections (V27 & V29)

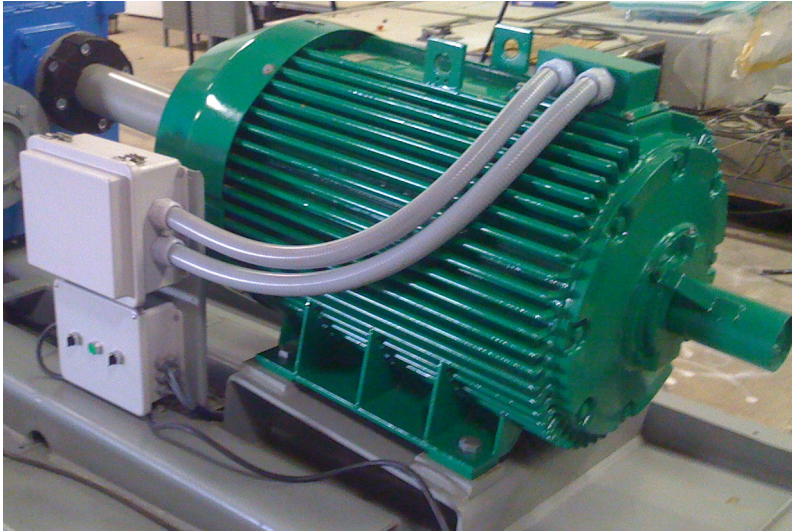
There is a option for a tower fourth tower section to be created here to raise the machine to 40m detailed drawings can be obtained from HALUS to create this extension in the UK.

50m towers with three sections (V39)

The ladders are completely repainted and the original fall arrest systems are installed. The fall arrest systems may need to be changed to comply with safety rules in the UK.

Generators

The generators are completely stripped down repainted all bearings are changed and the windings are completely re-wound, re-lacquered and tested.



Gearboxes

The gearbox uses a complete new gear system and bearing set. This means the only original parts are the outer cast casings. The V17 and V20 gearboxes have currently no filtration system it has been recommended that an off line filtration system is added to this to extend lifetime of bearings and gears.



Yaw gear

The yaw gear is replaced on all machines this includes a complete new large and small gear along with a complete new yaw gearbox rebuild this replaces all the components and only uses the outer gearbox casings new motors are also fitted here.

Electrical System

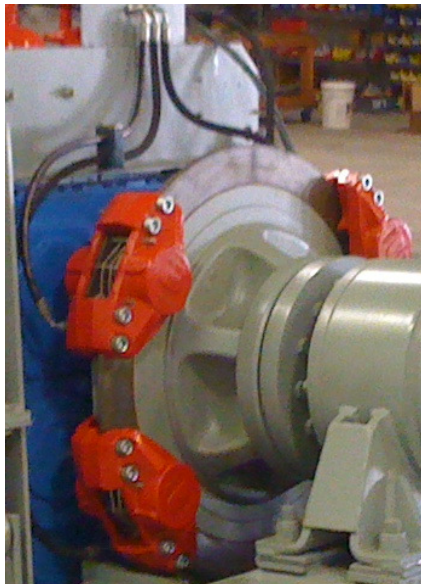
The electrical system is completely renewed in the V17 and V20 machines this controller is smaller and neater and can be connected to the internet using a highly advanced system, which will allow the turbine to be completely controlled remotely.

Additionally the system is fitted with control gear at the top of the tower for ease of servicing.



Other components

All large components eg castings and frames are completely stripped down and re painted new main shaft bearings are installed along with new rubber couplings. Brakes are completely renewed using new pads, bolts, pins, pistons and seals the brake disc is machined or replaced to achieve a smooth surface on its faces along with the correct thickness.



New hydraulic pumps and solenoids are fitted to all machines. The original accumulators are pressure tested painted and refitted or replaced.



The blades have the tip gear completely renewed (V17-V19) all blades are x-rayed and balanced in sets.



Conclusion

The turbines are manufactured to an excellent standard with all components being of the original high quality and in some cases better quality. Other parts such as towers, frames and casings etc, are used from a previous machine and painted to a very high standard using the newest technologies in paints.

The control system used on the V17 and V20 machines are much better than the original with excellent remote control capabilities. As the electrical controller is created in the US it will need to complete CE marking. The control system for the V27, V29 and V39 will be the original with some new components added this can be replaced with a custom system if needed.

Fall arrest systems may need to be replaced with a UK compliant system at a small extra cost (£1500 - £2000) approx

Halus offer a 1 year warranty which can be extended to 5 years if needed this warranty covers parts only.

If this machine were to be sold within Europe it would be recommended that all installation operations and maintenance was carried out by the wholesalers this way the warranty can be implemented by the wholesalers.