CTC AppNotes

A series of technical documents written by members of the CTC community

Executive Summary

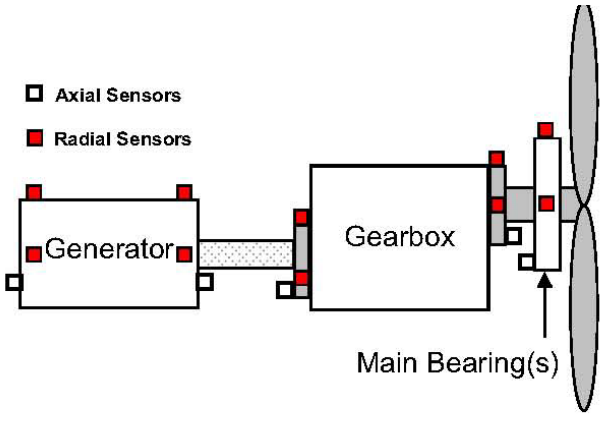
This edition of CTC APP notes will discuss the use of accelerometers to monitor Wind turbines for the production of energy.

Wind Turbines are a rapidly increasing source of renewable energy in this growing global economy. As such they are also prime candidates for the use of permanently mounted accelerometers due to the difficulties inherent with data collection. Turbines are generally mounted in remote areas on tall towers. These turbines contain many rotating elements that cause vibration and over time, with wear and tear, will eventually fail. The repairs can be very expensive and the work height prohibitive. The loss of electrical production can also be very costly.

Sensor selection

Low frequency accelerometers

On most wind turbines, the main bearing(s) and rotor shaft turn at less than 30 cpm. This would also be the turning speed of the input shaft for the gearbox. With a rotational frequency less than 30 cpm (0.5 Hz), low frequency accelerometers such as the AC135/136 series should be used. This will allow measurement of the main shaft rotational frequency, blade pass frequency, main bearing frequencies, and gearbox input shaft bearing frequencies and gear mesh frequencies.



Horizontal Axis Turbine with Accelerometers

General Purpose Accelerometers

The intermediate shaft and output shaft of the gear box will have higher rotational speeds and generate higher frequency disturbances relative to the bearings and gear mesh. The output of the gearbox will typically be rotating 50 – 60 times faster than the input shaft. As a result of these increased rotation speeds for the gearbox and generator, a general purpose accelerometer will work. General purpose accelerometers typically provide 100 mV/g and a frequency span of 30 –900,000 cpm (0.5 – 15,000 Hz).

Accelerometer mounting

The wind turbine is sitting on the top of a very high tower and the rotational components are not easy to access, every effort should be made to stud mount the accelerometers. Mounting locations on the main bearing(s), gearbox, and generator should be spot faced, drilled and tapped for threaded attachment of the sensor to the machine. General purpose sensors such as AC192 and AC194 series sensors should be used on these components. Installation toolkits such as MH117 -1B make the process simpler.

Cables and Connectors

For ease of installation and maintenance, component cables are recommended for wind tower applications. A sturdy and proven cable such as CB102 or CB111 with A2A or B2A style connectors should be used to take the signal from the sensors to a junction box or signal transmission point (wireless or otherwise) for easy access and monitoring.

A2A Connector with CB102 Cable

B2A Connector with CB111 Cable

Parts included in this discussion

AC135-1A 500 mV/g Top exit sensor
AC136-1A 500 mV/g side exit sensor
AC192-1A 100 mV/g Top exit sensor
AC194-1A 500 mV/g side exit sensor
CB102 Red Teflon jacketed cable, foil shield
CB111 Yellow Teflon jacketed cable Braided shield
A2A connectors with stainless locking ring
B2A connectors with seal tight boot.

If you have any questions or for Further information please contact CTC directly via Email at dgripe@ctconline.com or sales@ctconline.com or feel free to call 1-800-999-5290 in the US and Canada or +1-585-924-5900 internationally.