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Figure 5(a): AM1

Figure 5(b): AM2

Figure 5(c): AM3

Figure 5(d): AM4

Figure 5: Installation of accelerometer for gearbox condition monitoring.

In the above figure 5 shows the location of the accelerometer in the gearbox which almost covers all gearbox system. The mounted accelerometer notation given in figure 5. These 4 accelerometer transducers are mounted on gearbox one for planetary in radial direction AM1 or AM2 and one for each stage of gearbox AM3 and AM4.

The time domain parameter used to monitor the trend of overall vibration level over time a specific measurement location. For measurement of vibration we used one triggering mechanisms like a time interval based or vibration level based can be install in time domain parameter overall trending process. Whenever we use this trigger mechanisms, got a discrete frequency analysis snapshot. To evaluating these snapshots we identify the gearbox health &condition and also measure the amplitude & meshing frequency or gears.

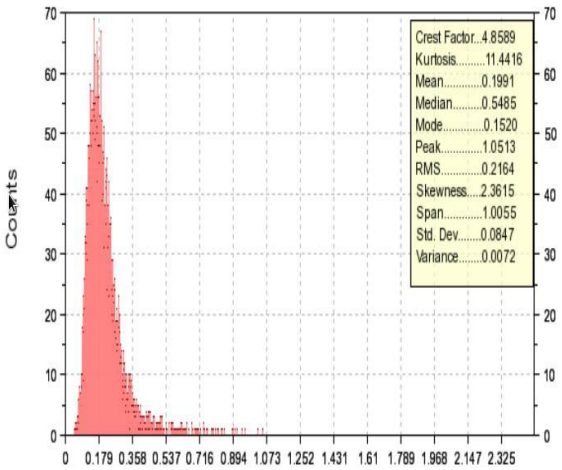

Figure 6(a): Healthy amplitude histogram.

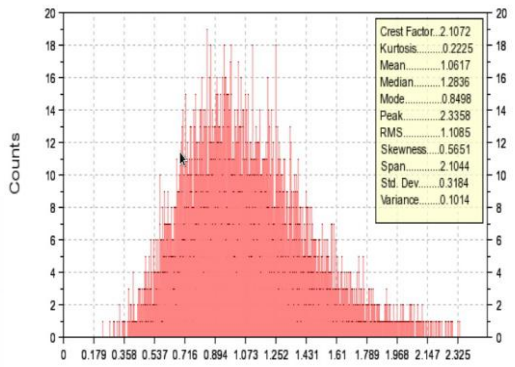

Figure 6(b): Abnormal amplitude histogram.

Line vibration analysis is another popular condition monitoring technique used by wind turbines. This line vibration analysis also known as stress wave analysis. The stress wave signals are come through friction and strike event in monitored structure. The results gives the stress wave technique is knows as amplitude histogram. In figure 6(a) and 6(b) stress wave amplitude shows. Figure 6(a) shows the healthy condition of helical gear and figure 6(b) shows the abnormal condition of helical gear.

5. Conclusion

Condition monitoring is effective method to evaluating the condition of machine or any other component. This paper condition monitoring technique applies in gearbox of wind turbine and analysis the health of gearbox. Vibration monitoring is one of the important methods of condition monitoring, here vibration monitoring method used to measure the fault and damage in gearbox. In gearbox we mounted some accelerometer and stress wave transducers which gives the vibration signal and vibration patterns. Time domain and Frequency domain two type of signal produce by sensors as per our requirement we choose any of them. This vibration signals gives the information about machine health and condition. It also helps to avoid the unnecessary maintenance of gearbox with considerable saving of resources.

References

[1] Broch.J.T (1984) "Mechanical Vibrations and Shock Measurement" Bruel&Kjaer, 2nd edition.
[2] Simmons G (1992) "Journal of Mechanical Energy Science" I Mech E, Vol.206, No.1.
[3] Gyarmathy.E (1990) "Journal of Power and Energy" I Mech E, Vol.206, No.1.
[4] LINARAJU. a paper on "condition monitoring and vibration analysis of rotating equipment" [NCCM-2006] December 2006 pg no 209-215
[5] R.K.Biswas "vibration based condition monitoring of rotating machines" national conference on condition monitoring [NCCM-2006] December 2006 pg no 34-40.
[6] G Suresh Babu(2013)"condition monitoring and vibration analysis of boiler feed pump" vol 3 issue 6 ISSN2250-3153.
[7] Berry, James E; Technical Associates of Charlotte, Inc; Charlotte, NC.;"Vibration signature analysis";1993.
[8] Ebersbach et al, (2005), "The investigation of the condition and faults of a spur gearbox using vibration and wear debris analysis techniques", international conference on wear of materials, wear 260, pp. 16-24
[9] R.M. Stewart, Some useful analysis techniques for gearbox diagnostics, Technical Report MHM/R/10/77, Machine Health Monitoring Group, Institute of Sound and Vibration Research, University of Southampton, July 1977.
[10] J. Power, Condition Monitoring on 47meter Wind Turbines, 2009, Wind Turbine Condition Monitoring Workshop, October 8–9, 2009, Broomfield, CO.
[11] T. W. Verbruggen, Condition Monitoring: Theory and Practice, 2009, Wind Turbine Condition Monitoring Workshop, October 8–9, 2009, Broomfield, CO.
[12] Wind Turbine Condition Monitoring Workshop Agenda, October 8–9, 2009, Broomfield, CO. [Online].
[13] Germanischer Lloyd, Guideline for the Certification of Condition Monitoring Systems for Wind Turbines, 2007, Hamburg, Germany.
[14] P. Veers, Databases for Use in Wind Plant Reliability Improvement, 2009, Wind Turbine Condition Monitoring Workshop, October 8–9, 2009, Broomfield, CO.
[15] A. Smulders, Challenges of Condition Monitoring for Wind Turbines and Successful Techniques, 2009, Wind Turbine Condition Monitoring Workshop, October 8–9, 2009, Broomfield, CO.
[16] A. Jardine, D. Lin, and D. Banjevac, A Review on Machinery Diagnostics and Prognostics Implementing Condition-based Maintenance, 2006, Mechanical Systems and Signal Processing, Vol. 20, Pages: 1483–1510
[17] H. Luo, R. Hedeen, D. Hallman, D. Richter, and M. Sirak, 2009, Synchronous Sampling in Wind Turbine Gearbox Condition Monitoring, 2009, Wind Turbine Condition Monitoring Workshop, October 8–9, 2009, Broomfield, CO.
[18] S. Butterfield, Vision for Advanced Wind Plant Health Monitoring: Beyond Gearboxes, 2009, Wind Turbine Condition Monitoring Workshop, October 8–9, 2009, Broomfield, CO.
[19] S Sheng and P Veers, wind turbine drive-train condition monitoring, presented at the mechanical failures prevention group, NREL/CP -5000-50698 October 2011