# RPM Independent Fault Diagnosis of Rolling Element Bearing

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## ABSTRACT

Rolling element bearings are the most widely used and the most frequently broken mechanical components in rotating electrical machines. Therefore, many studies of diagnose the bearing health conditions have been conducted. To apply the diagnosis technology in the actual industrial field, there are two problems. For one thing, as the system operates at various rotational speeds, the behavior of the features change which indicate the health of the bearings making hard to diagnose. For the other thing, as the failure criteria is different for each system, bearing sometimes does not replaced even under localized fault. Continuous operation in such a condition propagates the defect up to distributed fault changing health feature. Thus, in this paper, we investigate the bearing diagnosis of localized and distributed faults under different rotational speeds. A deep groove ball bearing was used for this study and three health condition cases were considered, normal case, localized fault case, and distributed fault case. Experimental data under different rotational speed were acquired from the laboratory-level bearing life test-bed. The acquired data were only the vibration signals, which were gathered using an accelerometer sensor. Then, a number of signal features for bearing fault diagnosis were extracted after preprocessing. We proposed a new feature, which base on residual energy density of defect frequency, and then compared with the traditional time and frequency domain diagnosis feature including root mean square (RMS), Kurtosis, fundamental defect frequency, and so on. Finally, our new feature was selected to best features that could better diagnose bearing fault levels irrelevant to rotational speeds.