

Fig.8 Frequency domain (dB) for velocity 0.50 m/s.

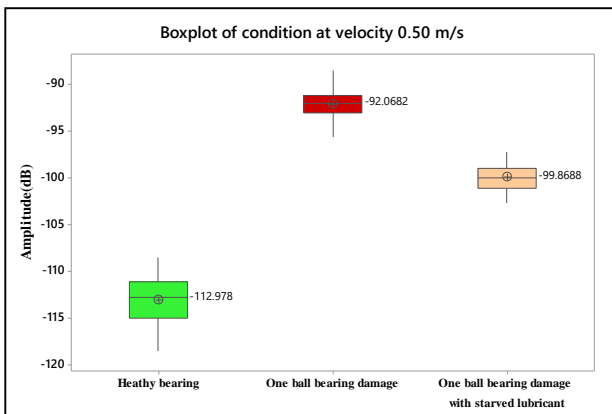


Fig.9 Boxplot comparison all 3 conditions at velocity 0.50 m/s

Table 2. Amplitude (dB) at velocity 0.50 m/s

Condition	95% Confidence interval
Healthy bearing	-113.49 to 112.46
One ball bearing damage	-92.58 to -91.55
One ball bearing damage with starved lubricant	-100.38 to -99.35

Table 3. Comparison of between healthy bearing and fault bearing conditions.

Target	Fault bearing conditions	Delta	%
Healthy bearing	One ball bearing damage	20.93	18.52
Healthy bearing	One ball bearing damage with starved lubricant	13.13	11.62

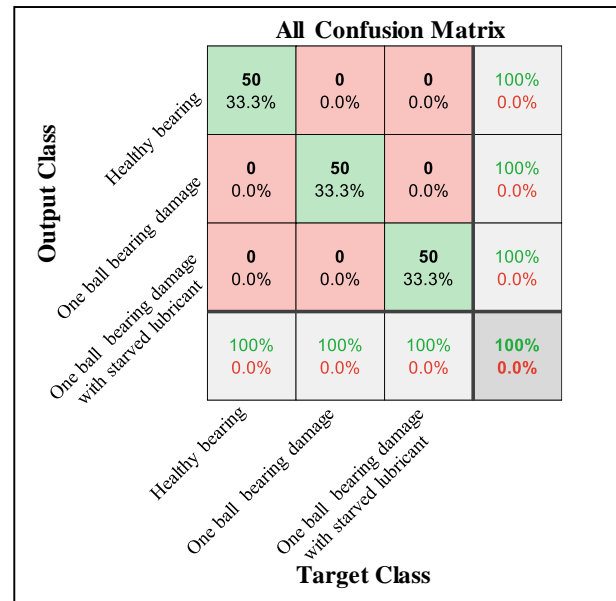


Fig.10 Confusion matrix

The ANN result shown the training stopped at 26th iterations. The detection and isolation values of the linear bearing condition of ANN training. The ANN can satisfy effectiveness detect and isolate of the linear bearing condition. The confusion matrix is conducted by comparing the forecast accuracy convergence. The accuracy percentage of the accuracy is 100% as shown in Fig.10. The test results demonstrated the detection and isolation values with decision making of the ANN analysis.

5 Conclusion

FDI method can be used for reliability improvement of the automation machine. Preliminary mechanical failure detection of the automation machine is very important in operational condition before the machine breaks down. This paper presents linear motor fault detection using FFT spectrum and ANN method in operational condition. The vibration amplitude can be analyzed the linear bearing faults at ball frequency of 53 Hz, according to motor speed of 50 m/s. In case of healthy bearing has been compared with one ball bearing damage and one ball bearing damage with starved lubricant, the vibration amplitudes were increased 18.52% and 11.62% approximately. The decision making of ANN method can be correctly identified the linear bearing fault. The experimental results show potential application of ANN and FFT spectrum technique as FDI tool for linear bearing fault detection performance.

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