Noise and vibration analysis for automotive radiator cooling fan

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This paper aims to analyse the noise and vibration of the automotive radiator specifically focused on its cooling fan for different fan conditions and different coolants used namely Ethylene Glycol (EG) water-based and Titanium Oxide (TiO2) nanofluid. Noise source identification is carried out by utilizing the sound intensity mapping method while an accelerometer is used to measure the vibration results. Both of these experiments are conducted when the fan was both in static and working conditions. The maximum cooling fan speed for the working fan detected by a tachometer for EG water-based is 1990 rpm while TiO2 nanofluid is 2030 rpm. The difference in speed is due to the different physical properties such viscosity of each coolant has where TiO2 nanofluid has lower viscosity than EG water-based. The maximum sound power level produced by EG water-based is 53.73 dB while TiO2 nanofluid is 101.94 dB. Meanwhile, the vibration frequencies of EG water-based are higher than TiO2 nanofluid. The noise level increases with the cooling fan speed but decreases with the vibration frequency. Apart from studying the noise and vibration of the automotive radiator, this research also analysed the potential application using nanofluid due to its great properties according to its major use in the heat transfer enhancement. As a conclusion, nanofluid as a radiator coolant could improve heat transfer rate, and could also reduce the presence of vibration in the automotive cooling system.