



# Influence of FeCl<sub>3</sub> Nanoparticle Dispersion in *Cassia fistula* Biodiesel Blend on the Analysis of Vibration and Noise Intensity of a Diesel Engine

Sheik Hidayatulla Shariff<sup>1</sup> · Srinivas Vadapalli<sup>2</sup> · Jaikumar Sagari<sup>2</sup>

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## Abstract

**Background** Among several energy devices, compression ignition engines have great energy efficiency characteristics. One of the principal drawbacks of diesel engine is enormous vibration and loud noise. Thus, it is conceivable to work with nanoparticle dispersed biodiesel blends for additional reduction.

**Purpose** The present investigation dwells on the influence of *Cassia Fistula* biodiesel blend (B20) and FeCl<sub>3</sub> nanoparticle on the compression ignition engine's vibration and noise investigation.

**Methods** The experimentation was executed at different injection pressures (IPs) from 180- 200 bar. Besides, the FeCl<sub>3</sub> nanoparticles were assumed as 50-100 ppm. Further, the dispersant was added at a quantity of 1:1 ratio.

**Results** The RMS velocity (vibration) and RMS noise were seen slightly minor for B20 apart from regular diesel. Likewise, the dispersant added FeCl<sub>3</sub> nanoparticle in B20 has revealed an admirable decrease in vibration and noise. Finally, the increase in IP was depicted as minor vibration and noise for all the fuels.

**Conclusion** The lowest values were attained for B20+75 ppm FeCl<sub>3</sub>+75 ppm dispersant. The least RMS velocity and RMS noise attained were 0.088 m/s and 55.25 dB for B20+75 ppm FeCl<sub>3</sub>+75 ppm for IP of 220 bar.

**Keywords** *Cassia fistula* · Biodiesel · Cetane number · Noise · Vibration

## Abbreviations

B100	Clean biodiesel derived from	B20 + 75 ppm FeCl <sub>3</sub>	
B20	20% biodiesel	+ 75 ppm Dispersant	20% biodiesel + 75 ppm ferric chloride + 75 ppm dispersant
B20 + 50 ppm FeCl <sub>3</sub>	20% biodiesel + 50 ppm ferric chloride	B20 + 100 ppm FeCl <sub>3</sub>	
B20 + 75 ppm FeCl <sub>3</sub>	20% biodiesel + 75 ppm ferric chloride	+ 100 ppm Dispersant	20% biodiesel + 100 ppm ferric chloride + 100 ppm dispersant
B20 + 100 ppm FeCl <sub>3</sub>	20% biodiesel + 100 ppm ferric chloride	ppm	Part per million
B20 + 50 ppm FeCl <sub>3</sub>		NaOH	Sodium hydroxide
+ 50 ppm Dispersant	20% biodiesel + 50 ppm ferric chloride + 50 ppm dispersant	IP/IPs	Injection pressure (s)
		BTE	Brake thermal efficiency
		dB	Decibel unit
		BSFC	Brake specific fuel consumption
		CP	Cylinder pressure (bar)
		NHRR	Net heat release rate (J/degree CA)
		FFT	Fast fourier transforms
		RMS	Root mean square
		ASTM	American Society for Testing and Materials

✉ Jaikumar Sagari  
sagari.jaikumar1@gmail.com

<sup>1</sup> Department of Mechanical Engineering, Avanthi Institute of Engineering and Technology, Vizianagaram, India

<sup>2</sup> Department of Mechanical Engineering, GITAM Institute of Technology, Visakhapatnam, India