
2.6.1 Stick-Slip

At low brake application speeds, it is possible for the brake lining and drum or disc to stick together for a short time, twisting up the vehicle suspension assembly. When the restoring torque builds up to the static breakaway value, the lining again slips against the drum/disc. This stick and slip cycle repeats rapidly, generating brake chatter, groan, or squeal vibration. This mechanism is attributed to a difference in the static and kinetic frictional torques and the spring-like restoring forces acting on brake components. The stick-slip mechanism produces a self-excited vibration with displacement-versus-time characteristics similar to a saw-shape form. This is the usual mechanism for low-speed brake chatter, although it can also exist in the form of a higher frequency squeal.

2.6.2 Negative Slope of the Friction Velocity Curve

This vibration inducing mechanism arises from a negative slope of the friction-versus-sliding velocity curve characteristic of certain materials in specific speed ranges. This causes instability in the system and excites vibrating components into nearly sinusoidal waveforms. An explanation is based on observations that the brake drum or rotor surface roughness asperities require a finite amount of time to produce equilibrium deformation of the brake lining material. The time that is available to deform the lining is decreased with increasing speed, restricting the time to compress the asperities in the friction material. Thermal effects, such as interfacial softening and changes of the chemical composition of surface layers, also have been offered as an explanation for the cause of the negative slope of friction versus velocity.

2.7 Comparison of 4-Wheel Disc Brake Systems With Front Wheel Disc-Rear Wheel Drum System

The almost standard use of front wheel disc brakes for automobiles has been due to some performance characteristics provided by this design. Because these brakes and the friction materials used with them (notably semi-metallics) can operate at higher temperatures than drum brakes, the