

# Understanding Tire Vibration Speed

Roger Leblanc – President Counteract Balancing

Over the weekend I was playing back in my mind talks that I had with a couple of mechanical engineers over the last few weeks. These men were very familiar with resonate frequency of suspension in Hz, but neither had made the connection with the RPM of the wheel assemblies. One of these engineers finally understood what I was talking about. It was amazing to see him finally connecting the dots between his studies as an engineer and the years that he had spent working for balancing machine manufactures and also as an educator on this subject of balancing tires. It was like somebody had turned the light on for him.

What was first explained as a problem, is that RPM is measured in minutes and Hz are a measurement of waves per seconds. They both knew that of course, but did not know yet what I was getting at. Once you multiply the known axle hop of 10 Hz vibration by 60 seconds you have the number of 600 hops, or waves per minute; this being the resonating frequency of a truck and trailer air ride suspension. 10HZ or 600 waves per minute is also known as the rebound frequency of the suspen-

sion. The rpm of the wheel assemblies at the resonating frequency is 600 rpm's. The out of balance heavy part of the wheel assemblies lead the edge of that 10Hz wave at the resonate frequency. The heavy spot in the tire wheel assembly travels from the top of that wave to the bottom of that wave at the same time as the vibration meter measured it. The wave is literally drawn by the rotating heavy spot on the wheel assembly as it rotates from the road surface to the top of its rotation. This is known as the resonating frequency or the wall, the speed where fuel usage increases drastically.

The impact of the heavy spot of the wheel assembly on the road at every revolution also causes a reverberation of much higher frequency that is also felt in the cab. This is better explained as being like hitting a tuning fork. This causes the tires to wear prematurely with the same action as a palm sander caused by this reverberation and also increases the rolling resistance. To test this reverberation, take a hammer and hit an inflated tire and feel the reverberation by placing your hand on the tire. Just 6 ounce static out of bal-

anced in an 18 wheeler tire will cause this, by multiplying to 60 lb at 60 mph through centrifugal force alone. Now just imagine a 60 lb hammer hitting that tire at every revolution of the wheel assembly, that's at a speed just below the resonating frequency. Now multiply that 60 pound force again 100 times and more for when the wheel assembly is in the range of 575 to 625 rpm, the start and end of the maximum felt vibration; the resonating frequency of the suspension. The peak is 600 rpm. Balancing all complete wheel assemblies will eliminate these problems by counter balancing the static out of balance.



Roger Leblanc of Counteract explains tire vibration.

