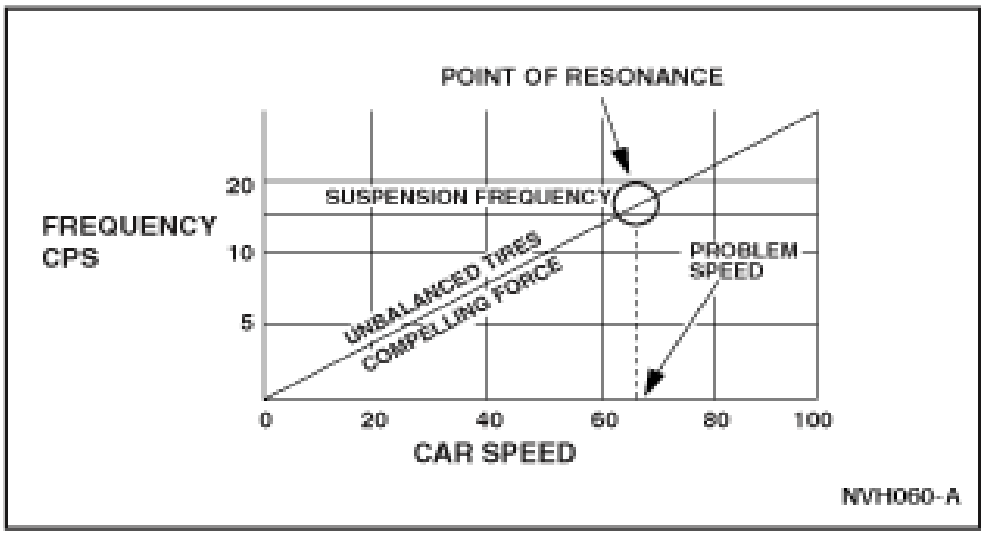
Resonance



Point of Resonance

Resonant frequency refers to the frequency of the applied force on an object that results in the greatest vibration. This point is where the natural frequency of the object and the frequency of the applied force meet. The natural frequency refers to the frequency range during which an object tends to vibrate. Natural frequency varies depending on the material composition, mass, and size of an object. Two identical looking objects with different material composition will have different natural frequencies and a different resonant frequency when acted upon by an identical applied force.

For example, a suspension system of a particular vehicle may have a natural frequency of 15 Hz which will remain constant at any speed. Suppose that this same vehicle has an unbalanced tire. As the tire speed increases, so does the frequency of the force created by the unbalance. At some point, the frequency of the force created by the tire imbalance will be the same as the natural frequency of the suspension system, causing the suspension system to vibrate. This is the point of resonance, or the resonant frequency.

NOISE

NOISE & SOUND

When we consider term “NOICE”, then we thing what is term “SOUND”?

Music is an art from whose medium is sound organized in time. It is a kind of vibration which travels through air, water and sensed by ear, i.e. a thing that can be heard. This is from music, speech and other thing like film dialogs etc., one thing in this mater is that we can increase or decrease the volume of sound.

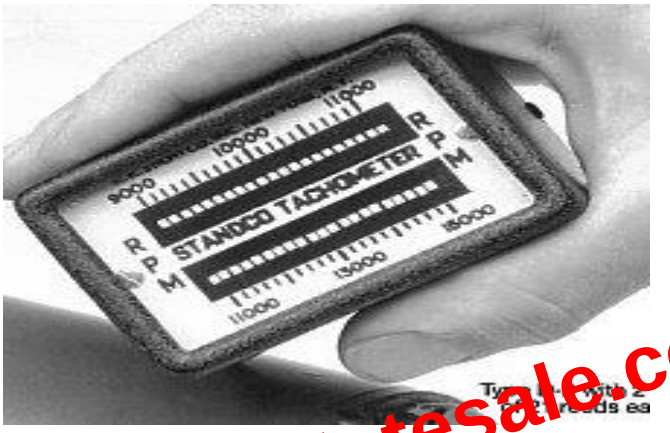
Noise is a sound from one and more at a time which can not heard clearly and only mixed sound will be heard. We cannot increase or decrease the Noise. If a meeting there will be a noise among the people talking each other besides the speaker going on talking. In a market, there we can hear the noise since several persons are on buying and selling. In a office one is talking on mobile, phone ringing another side, ring tone in some person’s hand, loud conversations with one and another, student talking in class room in absence of lecturer etc,. This is called noise.

In general, sound is vibration from particular machine, place or material which can be heard clearly whereas noise is a mixed vibration that will come to us from all directions. A sound can be clear and be able to hear, whereas a noise will not be clear and cannot be heard

Another away to put it, is that sound is a clear, wanted signal. Noise is random unwanted background

frequency. As the length of the scrolled wire changes, so does its natural frequency. Once the scrolled wire's natural frequency matches the vibrating component's natural frequency, this is the point of resonance (or its resonant frequency). It is at this point that the scrolled wire will vibrate with the highest amplitude.

Reed Tachometer



A reed tachometer is used to identify the frequency of a repetitive vibration. Some reed tachometers measure vibration frequency in cycles per second (Hz), others in revolutions per minute (RPM). The only difference between the two is face plate labeling since RPM values can be calculated from Hz values by multiplying by 60. The reed tachometer contains several reeds, each tuned to vibrate or resonate at a different frequency. The reeds range from 10 to 80 Hz or 600 to 4800 RPM, so the reed tachometer will only identify vibrations within this range. A knob located on the side of the reed tachometer is used during transportation to protect the reeds from excessive vibration. When the knob is turned, the reeds are held in place. The knob also serves as a reset to dampen out the reeds to obtain a better reading.

Vibration Diagnostic Tool Comparison

The sirometer is portable and easy to use with a little practice. The main disadvantage of the sirometer is its inability to measure a vibration's amplitude. The sirometer, like the other vibration tools, may not be able to locate the frequency of the vibration concern if other vibrations of strong amplitude are present.

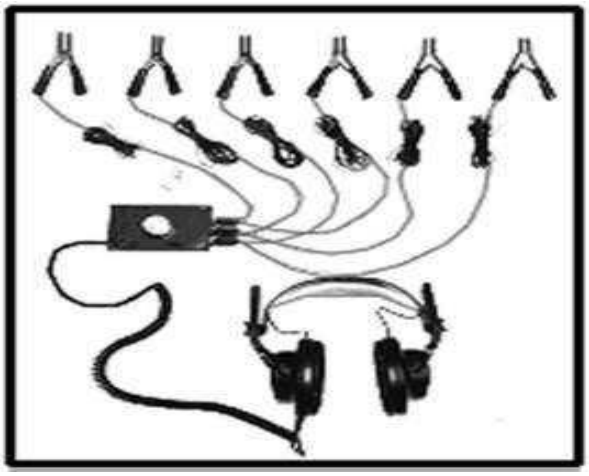
The reed tachometer also cannot measure a vibration's amplitude. Another disadvantage of the reed tachometer is that it displays many frequencies at once and can be difficult, if not impossible, to get a good reading on a road test. It is also fragile and easily damaged.

The EVA is the most accurate tool in measuring frequency and amplitude. The EVA also has a strobe function that can detect imbalance with rotating components. Other advantages of the EVA include the fact that it displays amplitude readings, makes recordings, and has remote sensors.

NOISE DIAGNOSTIC TOOLS

There are several diagnostic tools that can be used to identify noises. These tools can be very helpful in isolating problems and making your diagnosis easier. In this section, we will describe these tools and equipment.

ChassisEAR



2. COMPUTER SOFTWARE DIGNOSIS

RICARDO

Ricardo is a leading global provider of product innovation, engineering solutions, clean technology and strategic consulting since 1915.

Inventor of Ricardo is Sir Harry Ricardo.

Key features

- Direct and indirect vibrations solution
- Rayleigh and BEM (boundary element method) solution method
- Automatic creation of BEM meshes

NVH tools and techniques

The Ricardo NVH team is able to deploy the very latest methods and software

These are just some of the tools and techniques available:

Combustion noise development:

*. Ricardo uses a 24bit multi-channel noise analyzer for cylinder pressure based combustion noise assessment with a user-programmable structural attenuation

*. Advanced Design of Experiment (DoE) methods and processes for the optimization of combustion noise while achieving emissions and performance targets when developing calibrations

*. Power train Combustion Mechanical Breakdown (CMB) analysis techniques have been developed to provide detailed understanding of combustion noise improvement opportunities

Noise source identification:

*. Micro flown probes for direct measurement of acoustic intensity and noise source ranking

*. Acoustic camera for rapid concern identification