

Subject : Tire Vibration Reduction

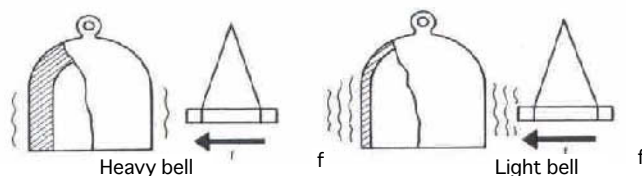
Recently the character of vibrations has changed from a lower frequency to a higher frequency. The following are some of the reasons.

1. Lighter Car Weight. Recently car manufacturers have been developing smaller vehicles with lighter body weights under the requirements of energy conservation. Conversely larger sized vehicles have become heavier due to the requirements of safety and many added accessories.

What has changed in all vehicles is the unsprung weight (that is weight not supported by the springs) has become lighter. Lighter unsprung weight results in improved vehicle handling, response and control.

The wheel and axle components are more finely balanced in vehicles with light unsprung weights. This results in any imbalance or vibration of the tire being transmitted through the steering system and being more noticeable in the vehicle.

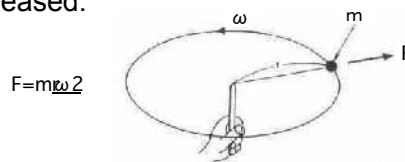
(For example : When riding in a light vehicle , such as a sports car, you are able to feel any vibration sensitively more readily).



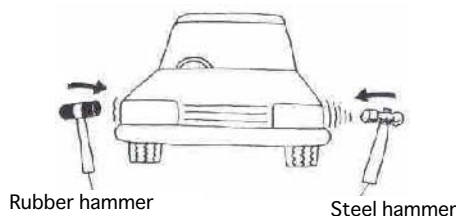
As an example, a light bell rings with a higher frequency than a heavy bell when hit with the same force.

2. Higher Running Speeds. Tire imbalance vibration problems mainly occur when the vehicle speed is around 100km/h. The high speed stability of vehicles has improved, and the opportunity to drive at higher speeds has increased.

The force of tire imbalance is increased in proportion to the square of the speed. As such, the vehicle speed has a larger influence on vibration levels, especially in modern vehicles.



3. Lower Profile Tires. A tire absorbs vibrations from the road by the sidewall. Low profile tires have low height sidewalls, which makes absorbing the vibration from the road difficult. Therefore the feeling of vibration is harsher with lower profile tires than with taller profiles.



As an example, when the body of a car is hit by a rubber hammer and a steel hammer with the same force, the difference in vibration is very noticeable.

Due to the above, the adjustment of tire and rim balance becomes more important.

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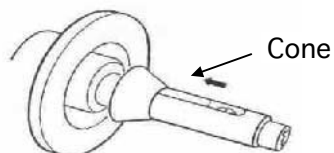
The following describe the important points in balancing tires.

1. Adjust to Nearly '0' Grams.

Many wheel balancers may indicate a minimum of 10 grams. This, however, is not acceptable for tire balancing in recent years. It is necessary that the balance machine indicate a tolerance below 10g. If the wheel imbalance (whether mounting on a vehicle or wheel balancer) equals $W1$, and if there is nearly 10g tolerance equal to $W2$, then $W1+W2$ may be close to (or over) the marginal vibration level.

2. Use Good Adapters.

Using good, well maintained adapters is important, but often these receive little attention. The use of a cone type adapter rear mounted is the better option. The hub centre mounts centric to the wheel centre, and using a cone adapter will give the same condition as when the wheel is mounted on the vehicle, and will minimize the differences in mounting.

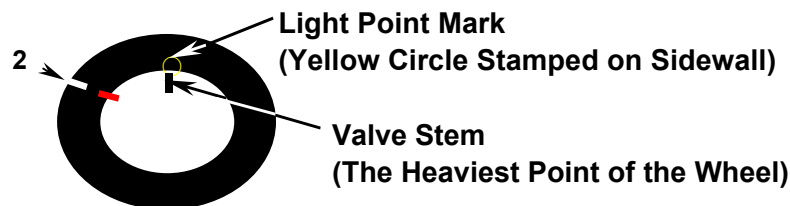


3. Measuring Tire Balance and Run-out.

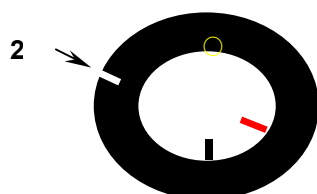
When the tire and rim rotate on a balancer, the pitch (radial run-out) requires noting. If there is a large radial run-out, vibrations will occur when driving. This will require an adjustment by breaking the beads and remounting the tire on the rim (see the 'Match Mounting Steps' following).

MATCH MOUNTING STEPS.

1. Match the lightest point of the tire (yellow circle) with the valve stem on the wheel as shown below. Adjust the tire-wheel assembly imbalance, thereby reducing the vibrations.



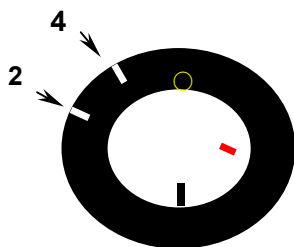
2. If the total radial run-out is greater than 1.0 mm, note the high spot on the tire and this spot on the wheel. Also mark a reference point on the tire opposite the valve location.
3. Break the tire beads from the rim and rotate the wheel 180 degrees. Re-inflate the tire and check the run-out again.



If the run-out is within acceptable limits (1.0 mm) the problem has been solved.

4. If the run-out is still outside the acceptable limit and the high spot is within 100 mm of the first spot of the tire, the tire should be replaced.

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5. If the high spot is now within 100 mm of the first spot of the wheel, the wheel should be replaced.

4. Mounting the Wheel on the Vehicle.

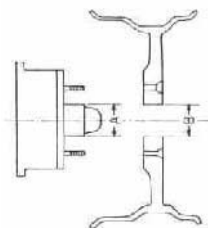
Wheels are classified as either "hubcentric" or "lugcentric", with most O.E.M. wheels being the hubcentric type. Hubcentric wheels are easy to centre due to the diameter of the hub hole of the wheel being almost same as the hub hole of the vehicle.

However in case of lugcentric wheels, the diameter of the hub hole of the wheel is larger than the hub hole of the vehicle. (That is the diameter of the lugcentric wheel's hub hole is different from the vehicle's hub hole.) This is why it is difficult to centre the wheels on the vehicle.

Lugcentric wheels come with locating rings for the vehicle hub. These locating rings are designed to fill the gap between the wheel hole and the vehicle hub. Ensure the locating rings are fitted to the vehicle before fitting the wheel. The rings enable the wheel to be centered correctly on the vehicle.

When tightening the wheel nuts, the bolt holes may expand from the lug nut pressure if the nuts are tightened completely using an impact wrench. For this reason the lug nuts should be tightened gently and gradually at first, then finally the nuts should be tightened completely using a torque wrench or torque stem socket adapters.

We recommend for you to pay special attention to the above when you fitting lugcentric wheels to a vehicle.



A < B Lugcentric

A = B Hubcentric (Mainly OEM wheels)

The problem of vibrations is becoming more critical. The problem can almost always be solved by using the latest balancer and associated equipment. Maintaining the balancer and associated equipment in good condition by regular maintenance is essential.