

Describe how a torque wrench relates to automotive physics

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A torque wrench can basically be described as a mechanical device that is used to apply a specific amount of torque to a fastener. Torque is a function of rotation motion and when it is applied on a wrench, it tends to have an influence on the rotation of an object. This force can be quantified as:

In the field of automotives, the concept of torque is applied in the design of the car engine system and the braking system which is directly related to the car tires.

1. Application in the automotive engine.

Engine power is a rating of how quickly work can be done. The relationship between engine power and horse power is:

In an automotive engine the combustion gas in the cylinder creates pressure against the piston which in turn creates a force which pushes it down. The force is transmitted from the piston to the connecting rod and from the rod to the crankshaft. This creates a torque which is in turn used to spin the crankshaft of the engine system. This force is created the same way as the force is applied at a distance in a typical torque wrench.

The horsepower of the vehicle can then be determined from the torque produced. The more torque produced by an engine, the more potential it has and an increase in torque results in an increase in acceleration.

2. The braking system and the design of tires

Torque is also very important in the braking system of the automobiles.

When the brakes are applied, the road surface exerts a backward force on the wheels and this result in a clockwise torque that causes backward acceleration. In the design of the braking system, torque is a function of the wheel radius and for a full circle braking system,

When a moving car is braked, the surface of the road exerts a backward force that acts on the wheels and this result in a clockwise torque that causes backward acceleration therefore stopping the vehicle. Manufacturers of in the tires industry must design tires that are capable of withstanding this friction without causing tear on the tires.

References

Tipler, Paul A. and Llewellyn, Ralph A., Modern Physics, 3rd Ed., W. H. Freeman, 1999.

Thornton, Steven T. and Rex, Andrew, Modern Physics for Scientists and Engineers, Saunders College Publishing, 1993.