

Disc vs Drum Brakes

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Aim of the Project

The Aim of the Project is to showcase the difference in performance between Disc brakes and Drum brakes. Our goal is to examine the operation of both types and discuss the advantages and disadvantages of both.

Disc Brakes

Current disc braking systems include components such as callipers, pistons, brake pads, rotors and tandem master cylinders. Disc brake operation:

- When the brake pedal is pressed hydraulic pressure is built up in the master cylinder.
- The master cylinder then pushes brake fluid through the brake lines which can be seen as the turquoise line in Figure 1.
- This pressure then reaches the piston which is located in the calliper as shown in Figure 1.
- The hydraulic pressure forces the piston to push the brake pads onto the rotors.
- This causes frictional force against the rotors which transforms the kinetic energy of the moving vehicle into heat, causing the wheels to slow down resulting in effective vehicle braking.

Disc Brakes Analysis

The performance of disc braking systems has proven to be highly effective resulting in modern vehicles using them on all 4 wheels.

There are many advantages to this system, some of which are:

- **Reduced Weight:** Disc brakes are lighter than drum brakes. Resulting in better handling and increased fuel efficiency.
- **Reduced risk of brake fade:** There is a much lower risk of brake fade as this system dissipates heat much faster.
- **Better Performance:** better repeated performance due to lower levels of wear and due to fast cooling.

Even though there are many benefits to disc brakes there are still disadvantages to the system:

- **Brake dust:** A common issue that occurs when the frictional material wears down producing brake dust which can get stuck within the callipers and cause components to function irregularly, i.e. Brakes sticking.
- **Corrosion:** The exposed design of the disc brakes means they are prone to corrosion from harsh conditions.

Drum Brakes

Drum brakes are used in the rear of vehicles due to the lower weight on the rear of the vehicle. They are more suitable for handbrake use and also require a less space.. They have a simple design of a round drum that rotates with the wheels. Shoes inside this drum are pressed against it by a hydraulic cylinder to slow the vehicle down.

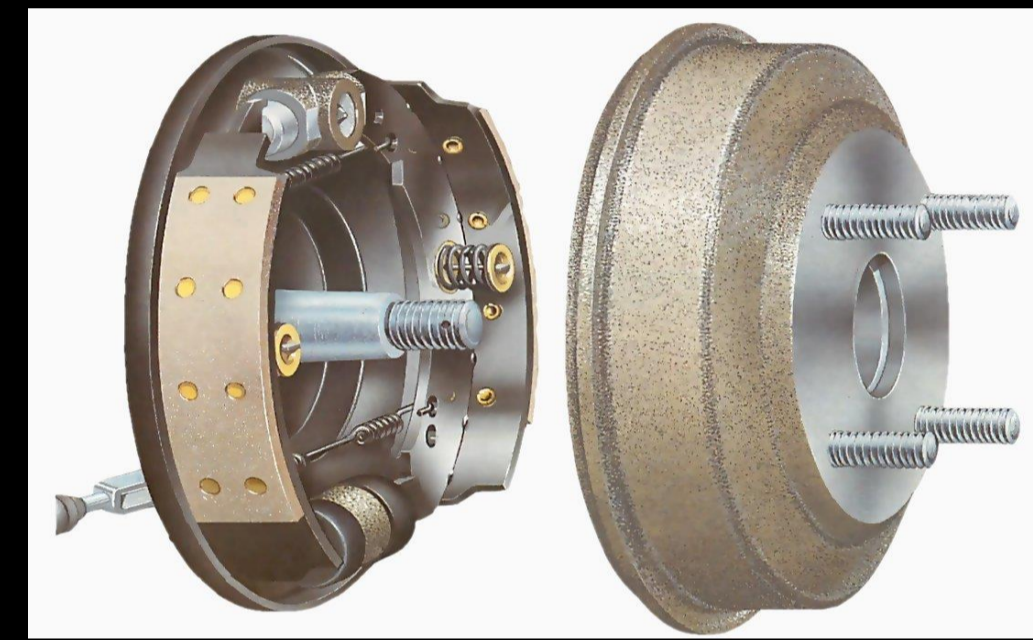


Figure 2: Simple drum brake design

Drum brakes offer several advantages over disc brakes:

- Drum brakes can exert greater braking force than discs of the same size by using the self servo effect.
- They have a longer lifespan due to increased friction contact area.
- Drum brakes are more cost effective to produce than disc brakes.
- Rear drum brakes produce less heat.
- Reconditioning wheel cylinders for drum brakes is simpler compared to disc brake callipers.

There are also some disadvantages of drum brakes, such as:

- During hard braking, drum diameter expands, requiring more pedal pressure.
- Brake shoes can glaze from overheating.
- High drum temperatures can vaporize brake fluid.
- Grab can occur which causes the shoe to stick to the drum, potentially causing brakes to stay engaged even after releasing the pedal.

Conclusion

Drum Brake / Disk Brake

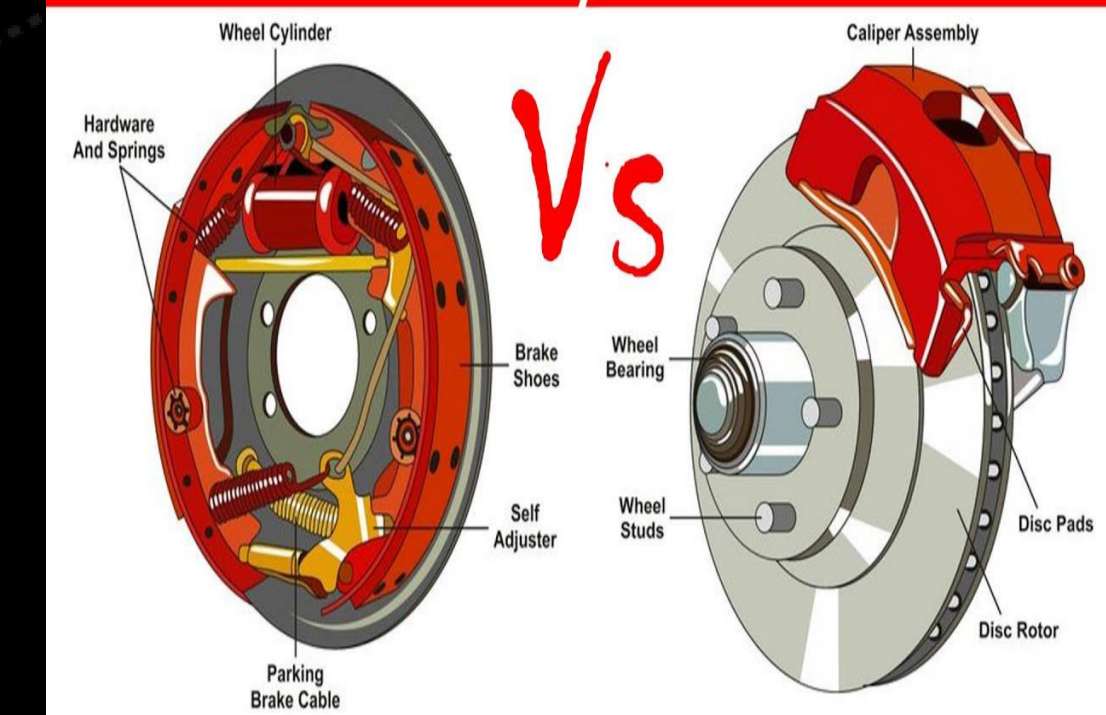


Figure 3: Disk Vs Drum Brakes

In conclusion, both disc and drum brakes have their advantages and disadvantages. For performance platforms, disc brakes can provide better stopping power and be lighter. On the other hand, drum brakes are more cost effective than discs, so are better suited for budget vehicles/economy cars. Drum brakes tend to be slightly more reliable than discs, and don't need servicing as regularly, due to having a larger friction contact area.

References

- [Drum brakes have advantages and disadvantages. Haynes explains the differences.](#)
- <https://www.autozone.com/diy/brakes/disc-brake-parts>
- <https://en-us.muon.bike/en-support-docs/disc-brakes>
- https://www.researchgate.net/figure/working-of-disc-brake_fig2_320627834

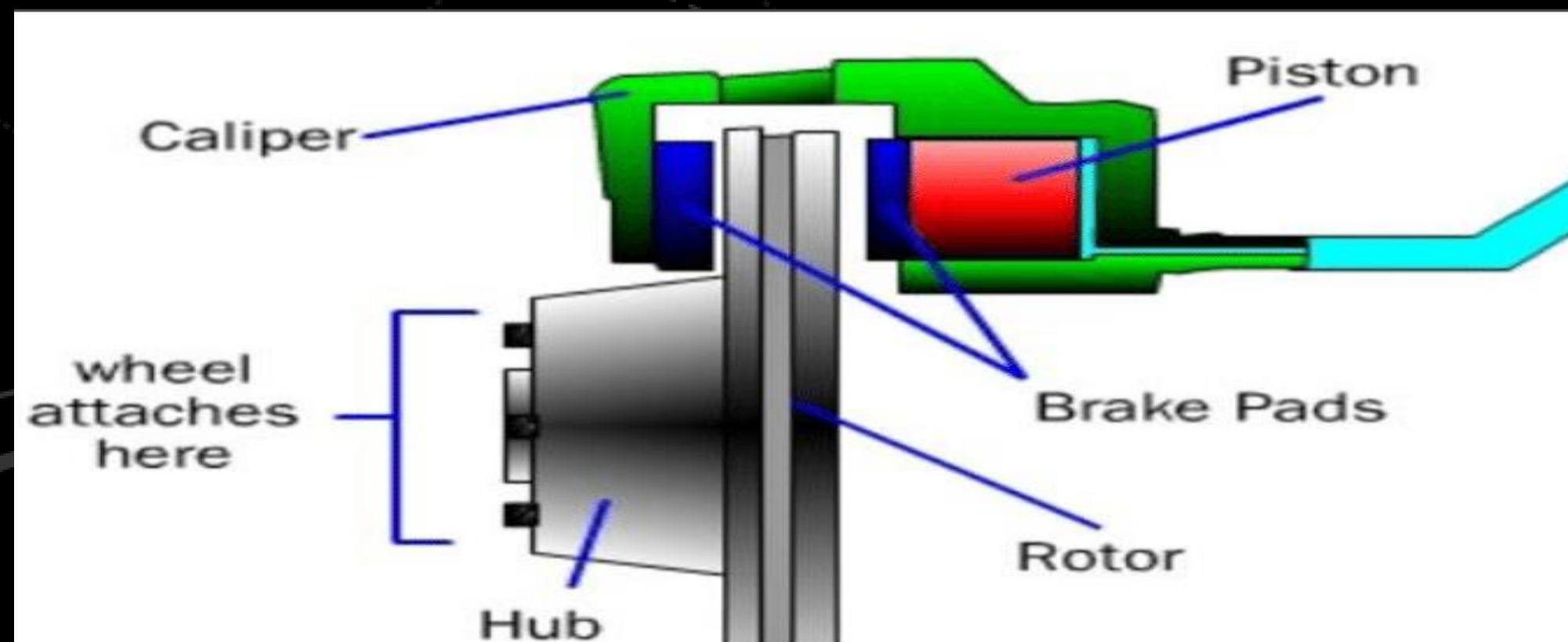


Figure 1: Disc Brake Components