

Technical Bulletin

The Truth about Brake Fade

Within the realm of braking, we hear a lot of talk about 'brake fade'. Within this technical bulletin we will clearly define the causes of brake fade and provide practical advice for how best to avoid it.

DEFINING BRAKE FADE

The term itself is largely self-explanatory and applies when the braking power of a vehicle reduces or 'fades'. Regardless of the component failure which is causing brake fade, the underlying cause is the same – excessively high temperature resulting from heavy braking and/or a heavy load.



PADS & DISCS

One of the main reasons for brake fade that results from excessively high temperatures is the reduction in braking coefficient between pads and discs.

Brake pads and discs are designed, manufactured and tested to perform across a temperature range which will prove more



than adequate for typical, on-road driving conditions. For example, **Comline brake pads are tested up to 700°C as part of our 'R90-plus' test protocol.** This is a temperature far beyond the realms of everyday driving in the majority of passenger cars.

However, add a heavy, over-loaded trailer to your car, or take it onto a racetrack, and you could generate the sort of temperatures required to experience brake fade. This is precisely why high-performance vehicles feature highly specialised and costly braking components – the McLaren P1 for example features ceramic discs coated in Silicon Carbide which are designed to operate at temperatures far beyond a typical cast-iron disc.

Pushing a cast-iron disc beyond its limits can see brake fade for two main reasons:



Material Transfer

Friction material of the pad can begin to break down at very high temperatures and adhere to the disc. Resulting in the pad contacting with an irregular surface. This causes premature wear to both the pad and disc, and can result in brake judder and contribute to brake fade.



Gas Slide

'Gas slide' is a term we have coined to explain what happens when the resins within a brake pad turn to gas due to excessively high temperatures. A layer of gas forms between the pad and disc causing the pad to slide off the disc and the brakes to fade. As temperatures reduce this gas will dissipate and reliable braking will return. Constant exposure to such temperatures would irreparably damage the brake pad as its essential resin content would all 'burn off' into gas.

'Gas Slide' can also occur with newly fitted brake pads at more everyday temperatures. This early life fade occurs for the same reasons as highlighted above because all new brake pads will release a small amount of resin gas the first

few times they are brought up to temperature.

To avoid this issue, technicians fitting new brake pads should always conduct a controlled 'bedding-in' process. Brake discs should also be bed-in for the first 300 miles after fitment to avoid 'warping'.

A modern high-quality brake pad is unlikely to result in any noticeable brake fade if bedded correctly and used within normal driving conditions.



VAPOUR LOCK

'Vapour lock' is caused by the water content of a vehicle's brake fluid being turned to steam inside the braking system at high temperatures. Vapour lock can be summarised as follows:

- Brake fluid is 'hygroscopic' and naturally absorbs water from the atmosphere. Increased water content lowers the boiling point and increases the risk of steam accumulating inside the system.
- Gases (i.e. steam) are compressible and, unlike incompressible brake fluids, are unsuitable for delivering consistent, reliable braking.
- If a vehicle has steam inside the brake system the driver will notice increased pedal travel is required and that braking isn't nearly as consistent, powerful or immediate.

PREVENTING BRAKE FADE

To prevent brake fade, Comline recommends the following:

- Ensure proper vehicle maintenance in-line with the manufacturer's recommendations.
- Always correctly bed-in newly fitted brake pads (and brake discs).
- Think about your brakes! The harder you work them, the higher the temperatures and the greater the likelihood of experiencing brake fade.

- ✓ Avoid repeated heavy braking.
- ✓ Avoid overloading your vehicle.
- ✓ Avoid riding the brakes on downhill descents.
- ✓ If you are doing something out of the ordinary with your vehicle (e.g. a track day), consider whether your braking components are fit for purpose and upgrade if necessary.



EXPERTS IN BRAKING