

Technical Guide.

Case study: Recurring Brake Judder.

Originally the vehicle was taken into the garage to replace a worn set of front discs and pads. After replacing the parts, the vehicle was test driven and the garage satisfied with the work that had been done. The vehicle was handed back to the owner and all appeared fine. However, a month or so later the vehicle returned to the workshop as the owner was now experiencing brake judder.

The garage assumed that the discs had 'warped' so therefore replaced them. After another test drive all appeared well again and the vehicle returned to the customer.

This scenario continued another 4 times and the garage continued to put the discs at fault as they had cleaned the hubs meticulously, used the correct types of lubricants and ensured that the pads were moving correctly in the caliper. Everything to ensure even material transfer. Suspecting that there was something seriously wrong with a batch of Apec discs the garage called the Apec technical helpline to raise their concerns.

Due to modern manufacturing processes and the materials used, a warped brake discs is a rare occurrence these days. Despite this, Apec take every complaint seriously and an appointment was made by a member of the Apec TechMate team with the garage in order to find the root cause of the problem.

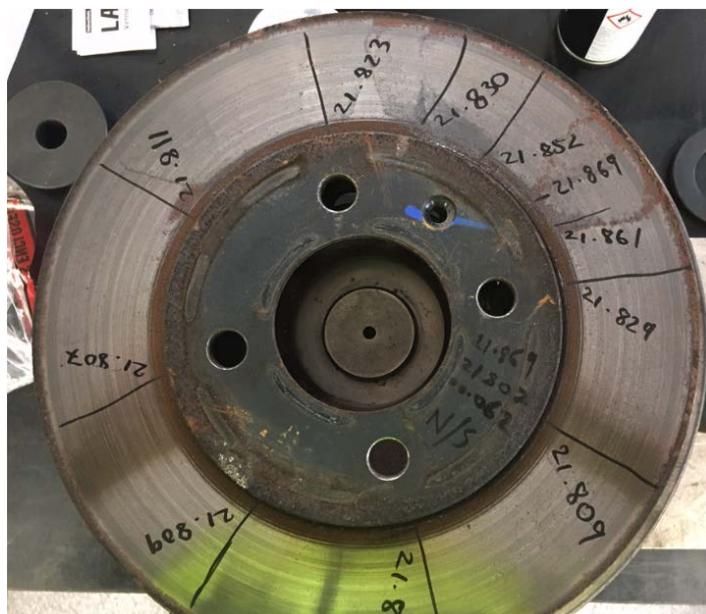
To ensure the correct diagnosis, Techmate apply their knowledge of brake operation. Techmate will always follow a process of eliminating external issues to ensure that the issue is resolved and diagnose by using precision measuring tools to ensure resolution of the issue.

Initially the vehicle was test driven to confirm the symptoms. Before stripping the vehicle, to eliminate any external issues that will replicate a brake juddering symptom, the tyres were checked for damage, the wheel bearings were checked for excessive movement and noise and the suspension bushes were checked for excessive wear.

Confident that the condition of all the components checked had not adversely affected the vehicle, it was stripped for the parts to be inspected and measured.

To confirm the condition of the brake discs, Techmate measured the thickness of both brake discs using at least 8 different points around the disc. The reason for this is to confirm whether the brake discs had indeed warped or whether the brake discs are suffering from excessive Disc Thickness Variation (please see our article 'Understanding Brake Judder' for more details). After measuring Techmate confirmed that the nearside front brake disc was suffering

from excessive Disc Thickness Variation as there was a variance of 0.05mm between the thickest and thinnest part of the brake disc. This variance will result in the symptom of 'brake judder' caused by the brake pads pulsating over the uneven surface. All Apec brake discs are tested before leaving the factory and will have a DTV reading $<0.013\text{mm}$.



The next step was to examine the braking system for any causes of uneven material transfer as this is the most common cause of DTV. The garage had followed best practices by ensuring the hub was thoroughly cleaned, the pads were lubricated with a non-metallic high melting point grease to facilitate movement, the sliders were sufficiently lubricated with a silicon-based grease and were moving freely and the caliper pistons retracted smoothly when pushed back and the brake fluid from the caliper did not have signs of contamination that might restrict movement of the pistons.

To confirm that the brake disc is in alignment, a run out measurement was taken to eliminate the brake disc as a source of misalignment. The maximum amount of tolerance for brake disc runout is $>0.08\text{mm}$. The runout reading from the nearside front 0.2mm which indicates that the brake disc has excessive lateral runout. To resolve this issue, Techmate needed to determine the cause of the runout. It is very common that the lateral runout is usually caused by the corrosion build up on the hub face, however the garage had been very meticulous and ensured that the hub surface was free of corrosion before fitting the new brake discs. To ensure that the hub was not causing the issue, a run out



measurement of the hub was taken. The maximum amount of tolerance for the hub runout is $>0.04\text{mm}$. The nearside hub gave a runout measurement of 0.08mm . As the hub was distorted it was causing the brake disc to be misaligned when it was fitted, hence affecting the even material transfer process, gradually causing the brake disc to develop excessive DTV and manifesting itself into a

brake judder after a few thousand driven miles. As this underlying issue with the hub was not detected at the point of fitting the new set of discs and pads, the issue had never been resolved therefore causing the brake judder to always return after a few thousand driven miles.

Have you ever heard the phrase 'A stitch in time, saves nine?' Well in this case a simple runout check would have saved a lot of time and money! This simple check should be done on every disc replacement to verify that the discs are running true. Remember that the maximum runout reading is $>0.08\text{mm}$, so simply spinning the discs and checking with your eyes is simply not good enough.

The nearside front hub was replaced and cured the issue. The garage involved is now insist that for every brake replacement carried out, they will measure the runout of the brake disc with a DTI gauge to prevent from missing an underlying issue. Techmate was delighted to have assisted to resolve the issue.

If you ever have any questions, please feel free to contact our technical helpline on 01174 288100. Apec Braking is proud to provide you with technical information to support the quality of its products and to uphold its "Full Spec. Full Stop." promise to customers.