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# EXHAUSTED

With track day noise limits getting tougher we look at how four different exhaust set-ups will affect a car's dB levels.



It's difficult to get away from the fact that tuning your car will almost certainly make it louder. If you consider your engine to be a pump, the exchange of air, and in particular the combustion process, produces noise. The more you tune your car, whether that's fitting a bigger turbo, wilder cams or induction kit, the more air it will flow. All of these components attribute to a bigger 'bang' in the combustion chamber.

In most cars, the exhaust system has the biggest

single influence on the overall volume of noise emitted. It's the component most likely to determine whether you get on track as planned or end your day before it's even started.

There are hundreds of different types of exhaust available; single box, twin box, de-cat, sports cat, straight-through... it's all a bit of a minefield, and it's often difficult to relate these to how much noise will be produced. So, we thought a bit of investigation was needed...

## EXHAUST NOISE TEST

### THE TEST

We concentrated on one manufacturer's exhaust systems, the Milltek Sport range. This would enable us to see a direct comparison between the effects the different style of system would have, rather than the effects of different manufacturers' exhausts.

We followed existing guidelines on noise testing for track use, and did our additional tests to provide more info.

The standard noise test often used at track days is known as 'the static test'. The noise meter is placed half a metre from the car's tailpipe at 45degrees. The car is revved to 4500rpm or

three-quarters of the maximum engine speed. We chose the latter, equating to 5250rpm to give worst-case scenario results.

As our test was conducted at Bruntingthorpe, we took advantage of its drive-by noise meter. Drive-by noise testing is a grey area. Some tracks test from distances of up to 20m, others have noise meters at the side of the track. As we're looking for the worst-case scenario, we carried out the drive-by testing 5m from the car. We did two tests for drive-by: one at 3000rpm in second gear on light throttle, and one at 6000rpm to give a range of results.

### THE CAR

We're using PumaSpeed's Mk2 Focus RS. With plenty of aftermarket systems available, and with the car being so new the RS is perfect for this test.

Fitted with PumaSpeed's 380 tuning package this Focus

features mods such as larger injectors, Pro Alloy intercooler, ITG cold air induction kit and a 380 remap. In our RS Dyno Shootout back in issue 292 this very car produced a healthy 367.5bhp and 419.5lb/ft.

### THE EQUIPMENT

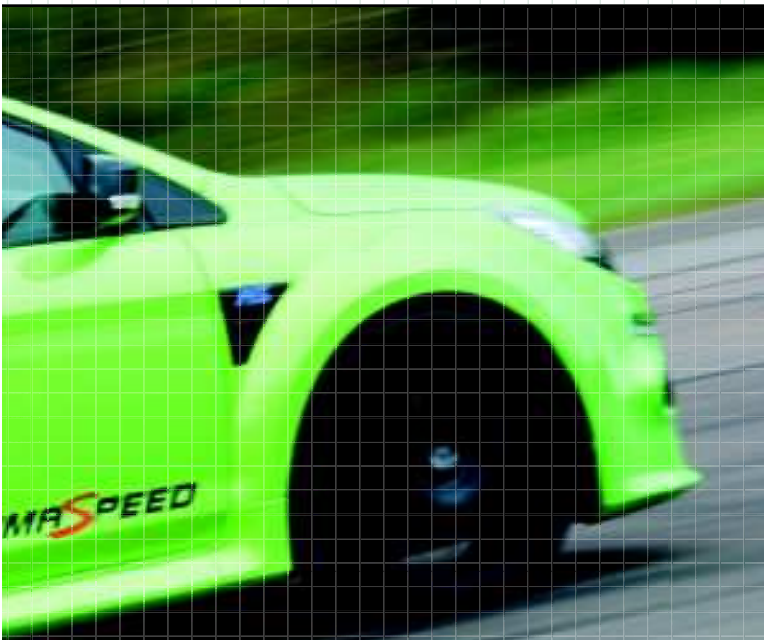
To give a spread of data, we used exhaust set-ups that differ fairly dramatically. Milltek Sport offers a selection of systems for the RS, including resonated (three silencer box) and non-resonated (two silencer box) systems, as well as de-cat and sports cat middle sections. The car was fitted with a Milltek large-bore downpipe, and all the pipework was 76mm (3in) in diameter.

By combining both the resonated and non-



resonated systems individually with both de-cat and sports cat sections, we had four separate tests.

We used a hand-held Testo 815 noise meter that measures accurately from 32-130dB, giving us an ideal range for the test.





# SUPERTEST

## RESONATED SYSTEM

### WITH SPORTS CAT

For the initial test we used the car in its existing set-up, which involved what we predicted would also be the quietest.

This set-up used the resonated cat-back system, which is a design that uses a single silencer in the middle, as well as two additional silencers behind the back bumper after the exhaust splits into two towards the rear of the car. The sports catalyst was also in place for this test, which

TEST ONE

acts effectively as an additional silencer. If the car intends to be track friendly, this set-up would be the best chance we'd have!

The car felt quiet to drive with no intrusive cabin noise, and the results were matched on the outside by some respectable figures.

Considering most track days have a static noise limit at three-quarters of the max revs of between 95-105dB, this was an encouraging start.

MEASUREMENT	DB LEVEL
Idle (45°)	71.2
3/4 max revs (45°)	79.5
3000rpm drive-by in second gear	72.8
6000rpm full-throttle drive-by in third gear	93.7

### WITH DE-CAT PIPE

For test two, we swapped the sports cat for the Milltek de-cat pipe, but left the rest of the cat-back system in place. This was pretty straightforward to do, and resembled a very common performance upgrade.

Standard catalysts are very restrictive whereas the Milltek example is designed not to be. However, there is no getting away from the fact that a sports cat is likely to act as another silencer in terms of overall noise output.

TEST TWO

That was our prediction, and as you can see from the results below, the difference between the sports cat and the straight-through de-cat pipe was pretty dramatic.

If you consider that a 10dB increase is generally considered to be an effective doubling of the audible volume, then it helps put into perspective that the 5dB increase that we experienced when we removed the sports cat for the full-throttle drive-by test is actually a pretty significant amount.

MEASUREMENT	DB LEVEL
Idle (45°)	75.3
3/4 max revs (45°)	89.6
3000rpm drive-by in second gear	75.5
6000rpm full-throttle drive-by in third gear	98.7





## NON-RESONATED SYSTEM

### WITH SPORTS CAT

This time we removed the entire exhaust system from the downpipe back and refitted the sports cat, but used the Milltek non-resonated cat-back system. This does away with the additional centre silencer found in the resonated system, and uses the two rear silencers alone. We knew it would be louder than the resonated, but we wanted to know by how much.

The figures here indicate that the loss of the middle silencer

but the gain of the sports cat gives similar results to what we saw in test two, where the sports cat was removed but the silencer remained.

This reinforced our theory that a catalyst acts as an effective silencer, although unsurprisingly the loss of the middle silencer provided a louder system than the addition of the catalyst. In terms of track day noise limits, the static test is still under the limit and the car would pass.

**TEST THREE**

MEASUREMENT	DB LEVEL
Idle (45°)	75.6
3/4 max revs (45°)	93.3
3000rpm drive-by in second gear	79.6
6000rpm full-throttle drive-by in third gear	99.3



### WITH DE-CAT PIPE

For our fourth and final test we re-fitted the de-cat pipe, giving us the least restrictive combination of the four tests. We had predicted that this would be the loudest set-up, and would have been the closest call when trying to pass track noise emission testing.

As the results show, the dB readings were the loudest of the four tests, as expected. When compared to the quietest readings from test one, all are in

the region of 10dB higher – a doubling of volume.

Obviously it depends on the individual track, but our results show that this system would still pass the majority of static noise tests, as they tend to vary from 98-105dB.

However, the drive-by readings are less clear-cut as each track tends to measure at different distances from the car, but it's highly likely that our test Focus kitted out with this system would still be able to get on track.

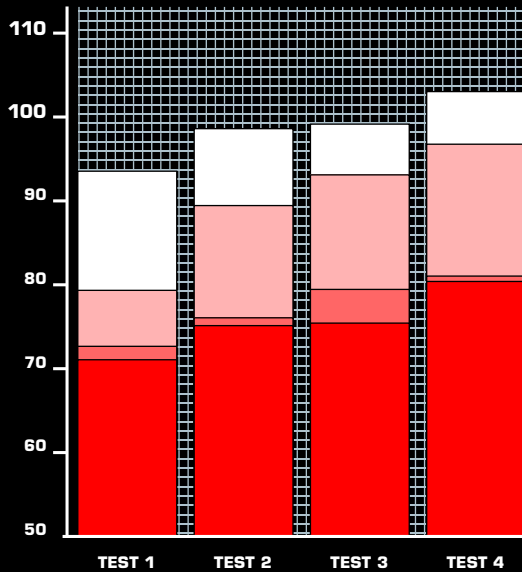
**TEST FOUR**

MEASUREMENT	DB LEVEL
Idle (45°)	80.9
3/4 max revs (45°)	96.9
3000rpm drive-by in second gear	81.2
6000rpm full-throttle drive-by in third gear	103.2





“THE POPS AND BANGS ON THE OVER-RUN WERE AWESOME.”



MEASUREMENTS

- Idle (45°)
- 3000rpm drive-by in second gear
- 3/4 max revs (45°)
- 6000rpm full-throttle drive-by in third gear



CONCLUSION

The results were pretty much what we expected. What's interesting to see is the difference experienced between the systems, compared to how they sounded inside and outside the car. To the human ear although the car sounded louder, it didn't sound twice as loud from test one to test four, but in reality it was nearly twice as loud in all of the measurements, as illustrated by the noise meter.

What's audible to us and what the noise meter reads can differ dramatically, so don't assume if your car sounds quiet it is. It depends on the type of noise emitted, and it's often the lower-down rumbles that trigger noise meters as opposed to the screaming higher-pitched sounds of a bike-engined car.

Looking at the results, the car would pass static noise tests without issue in every different set-up. The loudest reading taken from test four of just under 97dB is good, and the strictest track day noise limits we've experienced involve a static limit of 98dB, so the car would pass even in the de-cat and non-resonated set-up.

In terms of drive-by noise limits, individual tracks differ in how they record them. Bruntingthorpe, like Bedford Autodrome (one of the UK's toughest tracks in terms of noise limits), uses a drive-by limit of 87.5dB with a 1.5dB leeway depending on how many times the limit is broken. By measuring relatively close to the car the results we received were louder, but at no time

throughout the day were we asked to leave.

One thing to note from the testing is that if the Focus RS is representative of a typical car, then it's advisable to go for an exhaust system with as many silencer boxes as you can reasonably package if you are going on track.

For road use, there's no denying that the non-resonated system with the de-cat pipe sounded the best. The pops and bags on the over-run were awesome. We don't say this very often, but if you're looking to enjoy your car on track then to avoid disappointment, sensible is sometimes best.

