



## Feature

---

### The new Euro 7 standard: What does this mean for brakes? TMD Friction explains

**With the new Euro 7 standard, non-exhaust particulate emissions come into focus for the first time. Accordingly, from January 2025 at the earliest, strict requirements will also apply for brake and tyre abrasion on all newly registered passenger cars. As a specialist in brake lining technology, TMD Friction is assisting with the preparation of the Euro 7 in the area of brake emissions and is working closely with vehicle manufacturers and other suppliers. An innovative formula for brake pads and linings that produce low particulate levels is also in development, with the aim of helping vehicle manufacturers around the world to move towards pollutant-free, emission-free mobility.**

For many years the emissions produced by combustion engines have been a pressing issue in the public eye and one for which strict guidelines apply throughout the EU. Since 1992, legally specified limiting values have existed across Europe for pollutant emissions from new vehicles, with the aim of protecting people and the environment. The first standardised exhaust regulations for passenger cars in the European Union came into effect in 1970. Today's common term 'Euro standard' was introduced in 1992 with the Euro 1 exhaust emissions standard; Euro 6 now applies. As a result of ever stricter limit values and increasingly sophisticated technology, the drive trains of modern vehicles have become cleaner and the pollution from fine particulates caused by combustion has fallen. Nevertheless, despite this success on the part of the automobile industry and the increasing number of electric vehicles, fine particulate pollution – particularly in cities – remains high. As a consequence, non-exhaust particulate emissions are now the focus of attention. This is because most of the fine particulates in road traffic are no longer caused by exhausts, but – regardless of the drive technology – by abrasion in brakes and tyres. With the Euro 7 standard, the battle against particulates has been extended to these particulate emissions, known to be harmful to health and the environment, in order to come closer to the EU objectives of pollutant-free and emission-free mobility.

### Measuring brake dust – but how?

The key to the new Euro 7 standard is to find a method that is, on the one hand, standardised and reproducible and that, on the other hand, reflects reality as closely as possible. To develop a suitable approach as the basis for Euro 7 in the area of brake emissions, experts from the automotive and supplier industries have been selected to form the Particle Measurement Programme (PMP) working group for the United Nations Economic Commission for Europe (UNECE). Since 2016, as an expert in lining technology and with its own research, development and production, TMD Friction has been an active member of this working group and shares its expertise in the field of brake emissions. The company is represented by Philipp Nyhof, Development Engineer at TMD Friction. Working with representatives of vehicle manufacturers, with other brake brands and also with test equipment manufacturers and research institutions, he examines and develops methods



## Feature

---

that will enable the abrasion caused by the braking process to be measured in a reliable, standardised manner in future.

While the combined exhaust gases can be recorded relatively simply in the exhaust pipe using a probe, the brake components rotate on the wheel. This results in the particles escaping not in a single direction but instead, thanks to the rotation of the wheel, rim and brake disc, in many different directions; therefore measuring brake dust emissions on the vehicle is much more difficult. When working at the test bench, it is challenging to capture all the brake particles. One potential solution could be to entirely encapsulate the brake system so that no particles can escape. This would, however, have an effect on braking performance since the encapsulation could hinder the dissipation of heat. Consequently, measurements taken on the test bench are to be performed using brake housing instead. Additionally, at least two separate measurement positions are necessary – one each at the front and rear axle.

The loss of particles between the brake and the sampling point must be kept as low as possible. To ensure this, isokinetic sampling is necessary in which the volume flow for cooling the brake is matched exactly to the extraction rate of the measurement device. This ensures that the measured values for the particle mass are not distorted.

To guarantee that the measurement results can be applied to real-life operation on the road, a standardised testing cycle has been successfully developed: the WLTP brake cycle. The cycle has been defined using real vehicle data and maps a variety of operating points of the brake over an extended period of time. This ensures that this method of recording brake abrasion is reproducible. It is intended that test bench-based brake emissions measurements will be standardised in future with this WLTP brake cycle. Another critical factor is that the vehicle model in question must be exactly reproduced on the test bench. The combination of brake pads and brake disc, along with the vehicle weight and the weight distribution, all have a significant impact on the wear patterns. These parameters must be represented on the test bench in addition to the brake blending on vehicles with electric drives. In real-life operation, regenerative braking ensures that the friction brake is used less frequently and therefore that less brake dust is generated. All these factors must be taken into account in the simulated testing cycle.

In June 2022, the Particle Measurement Programme (PMP) working group presented its first draft of a 'global technical regulation'. In this regulation, the measurement method, test cycle and test bench design are defined exactly so that brake particle measurement can be standardised, reliable and reproducible. The official global technical regulation is expected to be published in early 2023 so that a sufficient number of specially approved measurement devices can be developed, accredited and manufactured before Euro 7 comes into effect.



## *Feature*

---

### **Expert knowledge contributes to environmentally friendly pads**

The engineers at TMD Friction are not only blazing ahead on the path to low-emission mobility by participating in the design of appropriate methods for measuring brake dust emissions, they are also working actively with vehicle manufacturers on an innovative lining formula that enables low-particulate braking. Inevitably, pressing the brake will cause black brake dust to be formed; when the brake pads and brake disc come into contact, tiny particles are rubbed off and tossed into the air. For a long time now, TMD Friction has used environmentally friendly pad mixtures to reduce these fine particulates. In the company's development department, where all pads for the Textar, Mintex, Don, Pagid, Cobreq, Nisshinbo and Bendix brands are created for both the original equipment market and the aftermarket, protection of health and the environment, along with safety, are the top priorities.

Vincenzo Di Caro, Senior Manager for Vehicle Programmes at TMD Friction, comments: "The mechanical abrasion caused by braking creates fine particulate matter that is released into the environment and can lead to breathing and cardiovascular disorders. It is therefore important to know exactly which materials are being used. And this is exactly what we do, conscientiously, in each development process in our own laboratories. In 2013, we were the first brake pad manufacturer to develop a copper-free friction material as original equipment for a high-performance German vehicle – the BMW M3 and M4 models. And much of the aftermarket has now changed over to copper-free materials.

"Since 2011, we have been supplying the IAM with the e-pad, a special brake pad that significantly reduces brake dust emissions relative to conventional pads. Through solutions such as this we are making a significant contribution to environmentally friendly braking."

### **The right mixture makes the difference**

The company produces all its friction material mixes itself and is one of only a few brake pad manufacturers authorised to supply to series production. With its own development and testing division, TMD Friction provides the necessary knowledge to develop a specially adapted formulation for every vehicle and its requirements that delivers the necessary braking performance – this has been the exact core competence of TMD Friction for over 100 years. To achieve the desired end result, the engineers mix together a complex formulation of up to 43 raw materials. Only selected, high-quality materials are used here. The requirements of Euro 7 have forced the TMD Friction development engineers to face the challenge, once again, of reaching the best compromises in the selection of the formulation components that enable vehicles to brake while generating only very small amounts of particulate. To ensure a good overall package, the impact on performance, service life and economic viability of the pad is constantly being checked.



## **Feature**

---

“One major challenge here is that we are already getting started without the limit values having been finalised. To avoid time being lost, we are already working towards the objective that can be expected with a high level of probability,” says Di Caro. “In the first step we examine which combinations of raw materials can be used in conjunction with specially developed brake discs to reduce the emissions of brake dust. Neither safety nor braking performance can be neglected in the pursuit of low-wear, low-emissions pad compounds. This is how important the reduction of particulate matter is: braking behaviour is not only an important aspect for driving properties and thus for driving enjoyment, but it is also essential for safety purposes.

“The interaction of the brake pads with the disc is also key here. This is because the erosion of the disc material is a significant component of brake dust, where the quantity of worn disc material depends significantly on the selected formulation of the brake pads. Another decisive factor is the temperature behaviour of the brake disc. If it is capable of absorbing a lot of frictional heat and of dissipating it into the ambient air, this can significantly reduce wear and thus the production of particulates by the brake pads. For this reason, TMD Friction always takes the brake disc into consideration as the friction partner when developing brake pads.”

### **Racing against time**

The real challenge in the run-up to Euro 7 is the limited time available to the developers in which they can adapt existing and future developments to the new requirements and bring appropriate solutions to series maturity by 2025. The entire industry is currently working on concepts for reducing brake dust emissions – although the limit value has not yet been finalised.

Philipp Nyhof, Development Engineer at TMD Friction, says: “Developing a technical solution that will make a significant contribution to brake dust reduction by 2025 will require everyone to be quick off the mark. However, in the exhaust field, the automotive industry has always succeeded in developing ever cleaner and yet high-performance engines despite the steep limit values. This will now also be the case for braking systems.”

In the search for a new and unique combination of raw materials, we are clearly profiting from over 100 years of development know-how for the international automotive industry. In the past three decades, the company has developed, manufactured and tested more than 50,000 different friction material mixes in order to satisfy the demands of the industry. The friction material specialist is certain that, thanks to its development expertise, it will be able to match selected raw material combinations so closely again to offer vehicle manufacturers an innovative solution with regard to the avoidance of brake dust.



## Feature

---

### **BRIEF INTERVIEW**

**3 questions for Philipp Nyhof, Development Engineer and Vincenzo Di Caro, Senior Manager Vehicle Programme, TMD Friction:**

#### **What does the timeline look like for the regulation?**

Philipp Nyhof: “The Euro 7 standard is expected to come in for all newly registered vehicles from 2025 at the earliest. The Particle Measurement Programme work group presented a first draft of a ‘global technical regulation’ (GTR) in June 2022. This defines the measurement method, test cycle and test bench design exactly so that brake particle measurement can be standardised, reliable and reproducible. It is anticipated that the official GTR will ideally be published in early 2023. This would give the industry some two years of run-up time before Euro 7 comes into effect.”

#### **What are the prospects for brake emissions in electric vehicles?**

Philipp Nyhof: “In regenerative braking, the friction brake is used less frequently and therefore less brake dust is created. In future, the testing programmes will have to take this effect, known as brake blending, into account. It may be that today’s electric vehicles are already compliant with the future limit values for brake emissions now. It will of course only be possible to answer this accurately once we know the details. It is, however, entirely conceivable that electric vehicles will be able to continue using their current brake pads.”

Vincenzo Di Caro: “It could well be that we are talking about an interlude when it comes to the special technical solutions for brake components in order to comply with the limit values defined by Euro 7. If we consider now how many vehicle manufacturers wish to dispense completely with combustion engines from 2030 and that, from then on, most of the new vehicles being licensed will be electric – and may thus already comply with the specifications regarding brake dust by using friction material and brake disc pairings that are common today – then it is possible that we will be able to continue utilising the tried-and-tested friction material pairings. But we’ll have to wait and see about this, of course.”

#### **If we think now about the independent aftermarket, what impact will the Euro 7 standard have on brake pads sold for replacement or retrofitting purposes?**

Vincenzo Di Caro: “No direct impact at first because the Euro 7 standard is anticipated to apply from 2025 for all newly licensed cars. It will be at least one or two years after that before these vehicles start coming into independent workshops. At the same time, it must be ensured that the brake pads on the aftermarket also satisfy the current emissions limit values. I think it is highly probable that the ECE-R-90 guideline will be updated accordingly. This would then require not only – as is currently the case – that aftermarket brake pads and discs must match the original products in terms of performance and braking behaviour, but that the brake dust limit values are also complied with. For us, that would then mean that we will have to find a friction material concept that satisfies both the existing R90 requirements and also complies with the limit values for brake dust emissions.”

# TMD FRICTION

A NISSHINBO GROUP COMPANY



## Feature

---

### Images:



**TMD Friction Environment.jpg:** With the new Euro 7 standard, non-exhaust particulate emissions come into focus for the first time. Accordingly, from January 2025 at the earliest, strict requirements will also apply for brake and tyre abrasion on all newly registered passenger cars.



**Vincenzo di Caro.jpg:** Vincenzo di Caro - Senior Manager Vehicle Programme at TMD Friction



## *Feature*

---



**Philipp Nyhoff.jpg:** Philipp Nyhoff, Development Engineer at TMD Friction

# TMD FRICTION

A NISSHINBO GROUP COMPANY



## Feature

---

### About TMD Friction

TMD Friction, a wholly-owned subsidiary of Nisshinbo Holdings Inc., is a leading global manufacturer of brake linings for the automotive and brake industries. In addition to disc brake pads and drum brake linings for cars and commercial vehicles, the company's product portfolio also includes brake pads for motor racing and industry-specific friction materials. TMD Friction supplies the worldwide spare parts market with the brands Textar, Mintex, Don, Pagid, Cobreq and Nisshinbo. TMD Friction also develops and produces brake friction products for industry under the brand name Cosid. The TMD Friction Group has four locations in Germany and others in Europe, the USA, Brazil, Mexico, China and Japan and employs 4,500 people worldwide.

More information is available at [www.tmdfriction.com](http://www.tmdfriction.com).

### Contacts

Sylvia Nasemann

Communication Specialist

Independent Aftermarket

TMD Friction Holdings GmbH

Schlebuscher Str. 99

51381 Leverkusen

+49 (0)2171 703 2512

[sylvia.nasemann@tmdfriction.com](mailto:sylvia.nasemann@tmdfriction.com)

Janina Limbach

Senior Consultant

Glaenzer Communications GmbH

Decksteiner-Strasse 44

50935 Cologne-Lindenthal

+49 (0) 221 950 199 96

[Janina.Limbach@glaenzer-communications.de](mailto:Janina.Limbach@glaenzer-communications.de)