# Getting to grips with surfaces

**Dr Richard Taylor, global technical development manager at Shell Bitumen, highlights the importance of taking critical actions to tackle the challenges of pavement deterioration**

**All of us in the highways industry recognise that inadequate roads have a significant impact on the economy of the country. Indeed, recent surveys by the Asphalt Industry Alliance (AIA) and the Royal Automobile Club (RAC) paint an unsettling picture of the UK's road network.**

According to the AIA in its 2016 Annual Local Authority Road Maintenance (ALARM) survey, it will take 14 years to clear the carriageway backlog of repairs to get the UK road network back into reasonable condition. While in the RAC 2015 Report on Motoring, one in 10 motorists cited the condition and maintenance of local roads as their top concern.

In the UK, structural wear caused by lighter traffic, such as cars and lighter goods vehicles is considered negligible according to paragraph 2.6 of the UK's traffic assessment standard[1]. It is only heavier commercial vehicles that are considered to cause structural damage to a pavement.

Around 85 per cent of road construction activity is focused on repair and maintenance. Given that local authorities and their contractors face increased pressures on resources, it is therefore vital to identify and carry out the critical actions that will maximise valuable maintenance and repair budgets, reduce pavement deterioration and keep UK plc moving safely and productively. Key to this is a greater understanding of the road pavement. Determining the right surface course, binder course and base layers in the context of the effects that the location has on a choice of asphalt is paramount. However, as my focus is on tackling the problem of existing roads, I will focus on surfaces.

## Surface course

The surface course is the visible portion of the road structure. It is this layer that suffers most from the effects of vehicle loads and what I would describe as the effects of 'climate aggression'.

On heavily trafficked UK roads, two types of surface course predominate: chipped hot rolled asphalt (HRA) and thin surface course systems (TSCS). With both HRA[2] and TCSC surfaces, good frictional characteristics are essential. When wear to the stones takes place at the surface it can damage the microstructure. It is critical to take action, as deterioration can result in decreased safety. Abrasion of stones can also lead to loss of textural depth, which can result in pothole development. It is most important for those involved in the repair of major trafficked roads to be familiar with the factors that affect skid resistance and take steps to restore the surface level to acceptable levels.

In the UK, roads with lower traffic levels generally have asphalt concrete and HRA. Naturally enough, their durability is a function of the nature of the pavement itself and the type of road to which the road is subject. Different surface courses can withstand traffic and environmental distress mechanisms, but there's no silver bullet. Factors that must be considered when addressing the surface course include understanding the impacts of hot weather on bitumen in order to prevent softening, which can lead to flow. The impact here is increased rutting under the action of traffic. A susceptibility to frost, including cracking and pothole formation. This can be a problem in a climate such as ours in the event that the bituminous surface is not adequately protected or replaced toward the end of the surface's life, or if existing pavement deterioration remains unchecked.

## The role of binders

Commonly, penetration grade binders are used within surface and binder courses. Conventional bitumen performs well, but it may not be able to help address all of the challenges our modern roads face. Polymer modified bitumen (PMB) is a proven solution to deal effectively with some of them. Shell Bitumen laboratory studies support the benefit of using polymer modified binders to improve durability (reduced chances of fatigue and low temp cracking), resistance to deformation and better binder and aggregate adhesion. Using anti-rutting studies[3] our laboratory tests demonstrated that rutting was reduced by up to three times on polymer modified asphalt (over 10,000 revolutions) in comparison to a 35/50 penetration grade binder.

In conclusion, it's important to determine the traffic and environment-induced stresses that a pavement must withstand without exhibiting unacceptable levels of deterioration. Functional characteristics such as skid resistance, noise reduction and durability notwithstanding, management of surface water might be an important maintenance consideration that affects the material choice. As indicated, the surface layer is important for the pavement performance but no single material can provide all the desired characteristics to improve and sustain our highways.

[1] Highways Agency et al., 2006a
[2] Shell Cariphalte Dense Mixture (DM) is extensively used in Clause 943 High Performance Hot Rolled Asphalt
[3] Anti-rutting performance results from Hamburg wheel tracking test performed under warm water (50oC) (stone mastic asphalt) 0/11 S granular curve using 35/50 bitumen and 2.5% and 7% SBS modified bitumen