Maintaining skid-resistant roads

Howard Robinson, chief executive of the Road Surface Treatments Association (RSTA), explains why surface retexturing provides a quick, efficient and cost-effective way of maintaining skid-resistant road surfaces.

To obtain the best results it is essential to ensure the correct retexturing technique is employed and to plan the work carefully. The speed of the retexturing operation and the short duration of the works help to minimise road user delays and provides a significant benefit to both clients and motorists. The purpose of retexturing is to restore adequate levels of micro and/or macrotexture and thereby skid resistance. This latter quality plays a major part in crash/collision reduction and was highlighted by the initiative of the Department for Transport in 1987 when the Minister introduced minimum mean summer SFC values for motorways and trunk roads. The importance of surface texture has been highlighted by TRL Report LR 286, which stresses that texture depth is important under both wet and dry conditions.

Current guidance is available in the Design Manual for Roads and Bridges (DMRB): Volume 7 Section 5 Part 2 - HD37/99*. However, the Highways Agency are currently revising parts of the DMRB so retexturing may end up in HD32 (Maintaining Concrete Roads) and HD31 (Maintaining Asphalt Roads). A number of retexturing techniques are identified in the current DMRB as follows:

- Bush hammering
- Shot blasting
- Grooving/grinding
- Longitudinal slabbing
- Orthogonal grooving
- Carbonising
- Water jetting

More recently a new technique has entered the market called fine milling which removes a shallow depth from the road and is carried out in a very controlled manner. The existing surface is not removed. Treatments that remove surface matrix must be used with caution, particularly on ageing surfaces, to ensure aggregate support is not removed. Treatments that impact the surface must similarly be well controlled – too great an impact pressure may potentially dislodge surface aggregate.

Accordingly, the resulting improvements can be measured by texture depth and/or surface friction measurements. Contractors must assume full responsibility for the quality of the work undertaken and to apply their experience to deliver the best possible outcome. Clients can specify at the outset what they are looking for in terms of improvement, essentially clients can specify end-product performance, but must be realistic in their expectations.

Quality assurance

Retexturing contractors have traditionally operated to first party quality assurance schemes. However following the recent inclusion of retexturing techniques within National Highway Sector Scheme 13 contractors are now required to become certificated to BS EN ISO 9001.

Treatment selection

It is essential to choose the correct retexturing treatment when planning to restore surface characteristics to ensure that the existing surface can actually be treated and that the required level of skid resistance can be restored for the required length of time. Choose the right technique and it is likely that the process can be repeated again when required at the same location and on the same surface.

It is important to note that retexturing will not cure any underlying problems within the pavement structure and in these circumstances it should be regarded as a temporary holding measure until a permanent solution can be undertaken.

Whilst process specific specifications are usually available, it must be remembered that the resulting treatment can only be as good as the surface that is being treated. It is only improvements in texture – micro and macro – that will be achieved, not improvements to the condition of the surface course itself. Where the aggregate in the existing surfacing is not capable of resisting the polishing action experienced at that site then the restoration of skid resistance will only be temporary.

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There should be early contractor involvement between contractors and their clients, the purpose of which is to ensure total understanding of what the individual treatments provide.

Guidance on the range of retexturing treatments available can be found in Table 11.1 ’Appropriate circumstances and treatments for retexturing bitumen-bound surfacing’, in the DMRB Volume 7 Section 5 Part 2 HD37/99.

Additionally, as with all specialist highway maintenance processes/techniques, the quality of the treatment is totally dependent upon the effective maintenance and condition of the plant and equipment along with the relevant training, knowledge and skills of the operatives. This should be supported by good company management and relevant experience.

It is also important that clients inspect/measure sites immediately before and after treatment, supported by appropriate testing, to ensure that they achieve the desired result.

The following are some of the factors the client should consider in selecting the appropriate treatment:

- It is essential to make the right choice - all retexturing processes are not the same
- Assess the suitability of a particular retexturing process and the type and condition of the existing road surface - what needs improving, microtexture, macrotexture or both?
- Assess the potential weather implications, not all processes are weather independent
- Bear in mind that any treatment which is unable to follow the profile or contour of a surface precisely and unable to cope with surface deformation may leave untreated areas with low skid resistance
- Restoration of microtexture is fundamental if optimum levels of skid resistance are to be achieved
- Restoration of macrotexture becomes increasingly important – in addition to micro texture – as vehicle speeds increase
- Ensure a consistent retextured finish has been achieved across the full treated width
- Seek professional advice.

Mechanical and/or pressure wash sweepers can be used as appropriate to clean the road surface after retexturing is carried out.
Retexturing techniques

Impact methods
Processes in this category involve striking the road surface with either hard-tipped tools or hard particles (steel shot) to effectively improve skid resistance and/or texture depth. These processes are effective where the loss of skid resistance is mainly due to polishing of the aggregate particles and include the following techniques:

Bush hammering
The bush hammering process involves a number of independent fully controlled treatment tips which mechanically restore skid resistance to any existing surface. The technique is applicable to all road surface types including surface dressings, asphalts, e.g. hot rolled asphalt, thin surfacings, and concrete. This treatment improves and restores microtexture by re-profiling aggregate to recreate the original sharp angularity of the aggregate and removing polished particles and fines. Macrotecture will also be improved depending on the surface.

This technique follows the surface profile and can cope with surface deformation and variations in road width, using instant variable width control, providing a consistent and even skid resistance to the treatment area. The surface levels of the treatment area remain the same as the surrounding surface and the treatment is repeatable.

The treatment causes no damage to joints/repairs and traffic loops. Road markings, road studs and ironwork do not need to be removed prior to treatment and can be avoided if necessary.

The process can be used in any weather conditions and equipment is available to treat large and small areas.

Shot blasting
Abrasive blasting is effective in removing surface polish, giving an improvement in micro and macrotecture.

Shot blasting involves graded steel shot being projected at high speed and at an optimum velocity from a rotating wheel. The technique improves surface texture by abrading and re-profiling aggregate and removal of bituminous matrix, fines and detritus. Equipment is available which is suitable for treating both large and small areas including different blast head widths.

The treatment causes no damage to joints/repairs and road markings and road studs do not need to be removed prior to treatment. The surface levels of the treatment area remain the same as the surrounding surface.

Cutting and scabbling/flailing methods
Longitudinal scabbling:
Uses hardened tips set into steel washers, loosely mounted side-by-side hydraulically loaded and drawn/rotated (on several axles around a central axle) along the road surface. The arisings are swept up separately
- Microtexture is improved by cutting through the surface aggregate and exposing new aggregate faces, creating a corduroy effect
- Depending on the surface initially surface texture depth can also be improved by creation of longitudinal grooves but the process can also reduce texture depth.

Grooving/grinding
a) Longitudinal grooving/grinding:

Grinding with longitudinal grooving (following surface profile) involves the creation of longitudinal grooves using diamond tipped saw blades. The closely spaced saw blades cut grooves at a predetermined width and depth and this process follows the profile of the surface. The surface levels of the treatment area remain the same as the surrounding surface and the treatment is repeatable.

This technique improves microtexture and macro-texture and has the potential to reduce tyre/road noise. The treatment causes no damage to joints/repairs and road markings, road studs, ironwork and traffic loops do not have to be removed prior to treatment.

b) Transverse grooving/grinding:

Uses diamond tipped blades and pressure washing to remove slurry. It can be used to provide discreet grooving patterns and can aid surface water drainage (has little effect on skid resistance) and can lead to increased tyre/road noise levels.

Both processes can be used under wet conditions.
**Fine milling**
Fine milling (following surface profile) involves the creation of longitudinal grooves using tungsten tipped cutting tools set at 6mm spacing. The machine has accurate level control and removes the top 2-6 mm of the road to achieve a new running surface. This can also be used to provide a key for an overlay treatment. The cutting drum can adjust the number of revolutions per minute to alter the texture depth in different surface materials. In reducing the overall level of the surface, all cats eyes and street furniture need to be removed or reset. The technique is fast and improves microtexture and macrotexture, thereby improving skid resistance and increasing texture depth. It can be used under all weather conditions.

**Fluid action**
These systems are not mechanical reworking of the road surface, they are effective removal/cleaning systems:

**Water jetting**
This process involves the controlled jetting of water through a series of nozzles at high pressure onto the road surface. It does not restore skidding resistance lost through the polishing action of the traffic. It thoroughly cleans the surface and removes surface contaminants and rubber deposits to expose and improve the existing macrotexture (below: HRA before and after treatment).

*The DMRB is available from [www_standardsforhighways.co.uk](http://www_standardsforhighways.co.uk)*