

Cold and Wet Solution to a Cold and Wet Problem

The recent series of severe and extended winters have led to massive damage on the the UK's road network. Persistent sub-zero and wet conditions have left a long trail of defects in their wake; a loaded extra strain on road contractors already struggling with the problems of general winter maintenance. The increased pressure to keep the network safe and usable in such conditions forces the adoption of reactive or 'fire fighting' responses which often results in costly and repetitive works adding further pressure over time.

Winter conditions are not conducive to traditional hot road repairs, which bring their own set of logistical problems, even in good weather. Issues arise from having big 'kit' and traffic management, trained crews and limited access to hot material, all of which are not easy to manage efficiently and safely. This is particularly the case for smaller, reactive works in bad weather but like many of life's problems, if they are not 'nipped in the bud' they bloom, exacerbating the situation.

For many decades the use of cold asphalts has been an answer. These can be used at any hour without much specialist skill or equipment in quick responses to emergencies, however, this is certainly not the ideal solution. Cold repairs are inevitably temporary and repetitive (**see Fig 1**), bringing increases in cost, risk and congestion, all of which generates criticism and anger from the public. Indeed, there will be few road crew operatives who have not been abused by passing motorists, questioning the quality of repairs. An example of such public disapproval was clearly made on a recent BBC2 documentary in June (Route Masters – Running London's Roads, series 1 episode 2, Tues 18 June 2013).

So the obvious question remains - why can't cold asphalts always be used for first-time permanent repairs? Unfortunately, even given warm, dry conditions, using a skilled crew with all the correct kit and plenty of time, cold asphalts will never achieve the performance characteristics required to take the kind of traffic on the UK's network regardless of claims made on paper.

The reason for this is fairly simple. Cold asphalt is generally a hot mix grade 'cut-back' with a solvent. This means the bitumen binder is soaked in solvent to soften it and extend the storage time and allow usability without heat. If one were to consider the following situation; where a shovel or truck-bed coated with bitumen needed cleaning, most would reach for a solvent to dissolve it. However, herein lies the problem with cold asphalt; the bitumen needs to stick the aggregates together in the road, but it should not stick in the bag.

Furthermore, cold asphalt should be pliable but with some degree of stiffness. Achieving this balance can be tricky as the mixture must have the right balance of solvent to be workable but not too much that the aggregates are still 'independent' once laid and compacted. In winter, the challenge of accommodating these differing functions becomes exponentially greater. Low temperatures make cold asphalts very stiff and virtually unusable. Many contractors will attest to this - being forced to break up the material on the roadside and then pummel it until it's pliable takes time. Operatives frequently find it a real struggle to get the mixture into the hole, and even with this effort, the repair rarely stays intact. Ironically there are now 'cold-mix hotboxes' on the market to try to resolve this problem.

Even if the material initially stays put, the compacting action will drive out air voids, making it even more difficult for the solvent to evaporate. What generally happens is the solvent from the surface layer of the material evaporates faster through access to air and wind action, creating a harder 'crust' and effectively sealing in the solvent below (see Fig 2). As the road temperature rises the material is 'reactivated' by the remaining solvent and then deforms under traffic, accelerating the failure (Fig 1). If the material is so stiff that the air voids can't be driven out, it will fail even faster.

The situation is even more problematic when attempting to use cold asphalts in wet conditions. Obviously, solvents and water are not good bedfellows. Laying a solvent-based material on a wet substrate hampers any bonding, allowing water and, even worse - ice, get between the new and the old materials, making failure inevitable. Attempts to overcome this problem using aerosolised tack coats are rarely successful for the same reasons and only create more delay, risk and expense.

Lack of alternative measures, particularly for smaller reactive works, combined with the high rate of cold asphalt failure can force contractors to return to traditional slow and costly hot works methods in an attempt to shore up the low performance of cold asphalts. This could be seen as 'going back to square one' in terms of reactive response and the attempt to propose 'permanent' status for cold works also has an additional problem. The DoT's Specification for Reinstatement of Openings in Highways (SROH) was updated in April 2010 and although it certainly doesn't preclude the use of cold asphalt there is a new and significant demand which requires that all cold asphalt used for 'permanent' repairs must be strong enough to enable core extractions for testing - a very tall order for cold asphalts. The growing trend for Streetworks coring programmes, coupled with the funds raised by punitive defect notices seems to have encouraged muscular enforcement of the SROH requirements. The cost of failure of the repair in service or following core testing makes non-compliance a very substantial problem indeed.



Fig 1.



Fig 2.



Fig 3.

Fig 1: An example of the repeat failures from cold asphalt repairs

Fig 2: An example of 'permanent' cold asphalt failure displaying binder-bleed and consequential rutting

Fig 3: An attempt to extract a core sample from the material in Fig 2.

Taking all these problems into account and the huge desire for a high performance, storeable cold material led to the development of a product which claims to resolve all these issues. In 2006, Viatec UK launched Viafix, essentially another cold asphalt but with genuine technical advantages.

Viatec's Managing Director, Mike Reynolds explains, "Viafix uses a patented reactive binder technology which, on contact with water or moisture, not only cures into a coreable material but also binds itself to wet substrates including concrete and iron. The nature of the binder system is such that Viafix remains pliable well below freezing and can easily be thrown into flooded potholes, compacted by traffic, grading out into a level, skid-resistant surface (**see Fig 4 image sequence below**). In the early days, Viafix was being used almost exclusively for the out-of-hours problems or to resolve dangerous problems - particularly wet and cold conditions. This is probably because we always had to demonstrate the ability of Viafix to quickly fix 'nightmare' situations to prove it was worth the price. It soon became clear to many of our customers that these repairs would not fail, whatever the circumstances, unless there was a total failure of the fabric of the road. Surprised contractors were getting themselves praised on national television news reports as Viafix enabled them make permanent repairs in snow, sleet and rain (see <http://www.youtube.com/watch?v=cRM9stYw5g>)"

Mike Reynolds continues, "This was a nice bonus for us as a small company, but it did not have the slightest influence on the response from prospective clients, unless we physically proved to them that the Viafix claims could be shown in practice. Many of our customers claimed 'they had heard it all before' and many had burnt fingers as a result."

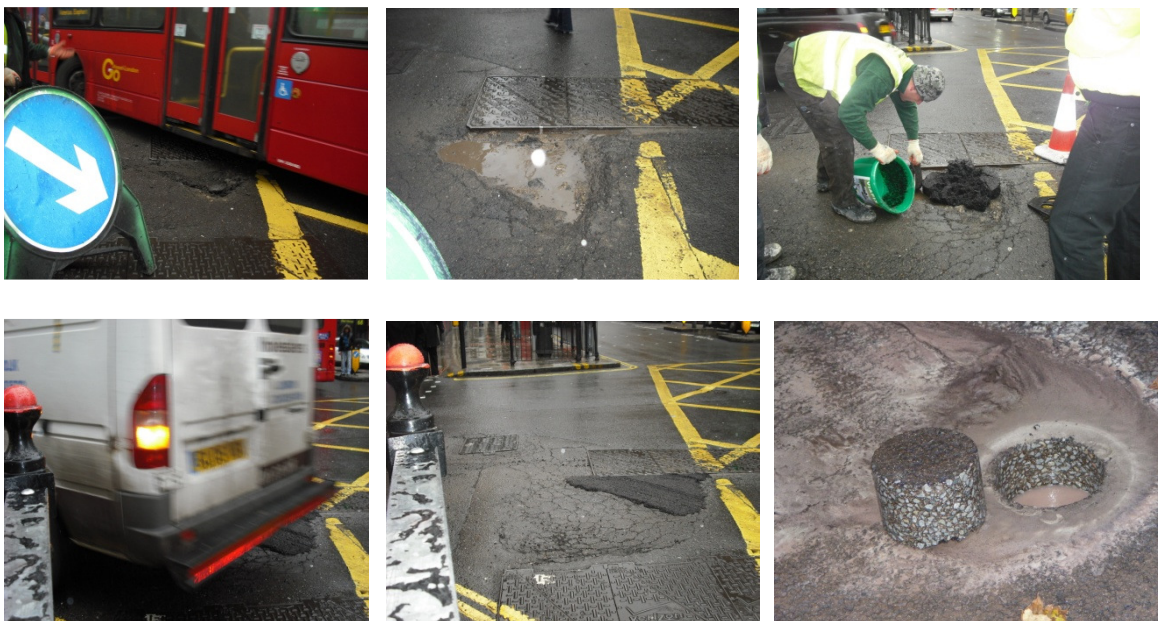


Fig 4 (sequence): Ironwork repair made in freezing conditions (sleet) on busy intersection (High Holborn & Kingsway) London Borough of Camden. Repair made during red-light phase, compaction by traffic. The final image shows a typical Viafix core, compacted in water at 2°C, cored after 18 hours.

One such (initially sceptical) client was Renfrewshire Council in Western Scotland. Brian Allison, Depot Supervisor, commented, "Even after 32 years in highway maintenance, I have never seen a more effective cold material. It really does do what it says it will. The first time we used it was three years ago during a cold, wet winter's night for a 'water-burst' on a busy arterial road and the Viafix repair is still there, completely intact!"

In fact, the success and growing demand for Viafix has created a bit of a logistical challenge for Viatec over the last three years. The production facility has been overwhelmed by demand in the winter and the company were forced into letting down a few loyal customers, something Reynolds describes as “intolerable”. He continues, “In 2009 we knew we needed to seriously increase our capacity.”

Fig 5: Client Testimonials

Client comments like Brian Allison’s are not unusual, says Reynolds. He provides many examples:

“The silver bullet of cold lays” - Lancashire Highways;

“It does exactly what it claims” - Cumbria Highways;

“The best thing since sliced bread, very impressive” - Transerv Scotland

“We call it magicadam ” - London Borough of Islington

“The dog’s!” - Surrey CC Materials lab.

“All your claims are true , it’s brilliant” - Highways Agency Area 10.

“Superb in the wet unlike the other stuff!” - Cambridgeshire Highways.

“Extremely versatile especially useful for busy roads” - East Lothian Council.

“Never had a defect with Viafix repairs, even in the London Borough of Bromley!” - BT Openreach.

A solution came in the form of a suggestion from Viatec’s customer Graeme Hay (Head of Service at Wiltshire County Council) who recommended speaking to John Wainwright Ltd, the leading independent asphalt producer. Hay was an early adopter of Viafix and understood it was a unique technology, having revolutionised the success and efficiency of defect repair in Wiltshire under Hay’s guidance. Wainwright also owned a rare hardstone quarry that could produce aggregates suitable for the manufacture of Viafix.

Wainwright’s Technical Director, Ian Timberlake, says, “Viatec’s Mike Reynolds called me to ask for a meeting, I didn’t know him or the company but I had heard rumours on the market of an impressive new cold product. I have been in this industry a long time and, generally speaking, when someone presents you with an ‘innovative’ product it invariably turns out to be a re-hash of something from the past. When Mike showed us the properties and performance of Viafix I could not believe it. Who would have thought in a million years that asphalt could be chemically hardened to such strength using water as a catalyst? Clearly we could not let this opportunity pass.”

Geoff Shearn, Wainwright’s Operations Manager, adds, “Viafix is simple and quick to use in all weathers, it works when nothing else will, you can throw it down even under water into thin course failures and have it compacted by passing traffic and it stays put. I call it ‘Viatec Velcro’. It locks down crocodile cracking, levels out depressions, fills joint failures and cracks. It’s also a great material for prepping up roads in advance of surface dressing as it stays put without saw-cutting and can be laid in the cold wet months prior to the dressing season. What’s more it doesn’t have solvent that would normally bleed through a surface dressing course.”

The result of Viatec’s meeting with Wainwright is a brand new, large-capacity production facility (**see Fig 10**). The facility has been designed with flexibility in mind to produce

additional mixes such as cold SMAs, HRAs, sand carpets and mastics - developed and tested using Wainwright's vast materials experience and high tech laboratory facilities. These mixes are currently in high demand, particularly from utilities contractors who are required to carry out 'like for like' reinstatements and have to match the asphalt type of the existing carriageway.



Fig 6



Fig 7



Fig 8



Fig 9

Fig 6: Water displaced by loose Viafix (in freezing conditions, Jan 2013)

Fig 7: Viafix dropped in by hand **Fig 8:** Compaction by traffic

Fig 9: Finished repair



Fig 10: Viafix mixer tower at the new high capacity production plant

Said Reynolds, "Another of the benefits this new facility gives us is the ability to produce large quantities of material sufficient to feed the demand of the utilities sector. This has previously been a difficult market for us because of the sheer volume required - yet they have the same problems in winter, exacerbated by the high standards required of SROH. We needed to prove Viafix could exceed the HAUC demands, so we commissioned a very detailed examination of Viafix in service through Surrey County Council's UKAS Laboratory. The UKAS Lab tested Viafix against a 100-Pen hot-mix and a cold asphalt well known to the market. The comparison trials were conducted on three road classes and monitored over two years. The cold asphalt began to fail very early in the class 2 and 3 roads but Viafix was doing as well as the hotmix and in some cases, better. Robbie at the lab called Viafix 'the dogs' which I believe is a compliment, however the official conclusion to the trial used more

technical language but definitely expressed a similar sentiment!” See: <http://www.viatec-uk.com/lab%20report.pdf>



Figs 11(L) & 11a(R): ‘Permanent’ cold asphalt bleeding and rutting



Figs 12(L) & 12a(R): Viafix in perfect condition, note the nine core-extractions