



Neutral Citation Number: [2020] EWHC 444 (Pat)

Case No: HP-2018-000003

IN THE HIGH COURT OF JUSTICE
BUSINESS AND PROPERTY COURTS OF
ENGLAND AND WALES
INTELLECTUAL PROPERTY LIST (ChD)
PATENTS COURT

The Rolls Building
7 Rolls Buildings
Fetter Lane
London EC4A 1NL

Date: 5 March 2020

Before:

MR DAVID STONE
(Sitting as a Deputy High Court Judge)

Between:

Geofabrics Limited

Claimant

- and -

Fiberweb Geosynthetics Limited

Defendant

Mr Michael Hicks (instructed by **Womble Bond Dickinson (UK) LLP**) for the **Claimant**

Dr Geoffrey Pritchard (instructed by **Withers & Rogers LLP**) for the **Defendant**

Hearing dates: 3, 4 and 6 December 2019
with further written submissions filed on 2 January 2020

APPROVED JUDGMENT

I direct that pursuant to CPR PD 39A para 6.1 no official shorthand note shall be taken of this Judgment and that copies of this version as handed down may be treated as authentic.

.....
MR DAVID STONE
(Sitting as a Deputy High Court Judge)

DAVID STONE (sitting as a Deputy High Court Judge):

1. By its claim form dated 13 February 2018, Geofabrics Limited (“the Claimant”) sued Fiberweb Geosynthetics Limited (“the Defendant”) for infringement of European Patent (UK) 2 430 238 titled “trackbed liner and related methods” (“the Patent”), seeking injunctions, an inquiry as to damages or an account of profits, and other remedies. The allegedly infringing product was said to be the Defendant’s Hydrotex 2.0 (“Hydrotex”), a trackbed liner used by Network Rail in the laying of railway tracks in the United Kingdom.
2. By its Defence and Counterclaim dated 11 July 2018 and later its Amended Defence and Counterclaim dated 13 August 2019, the Defendant denied infringement, and counterclaimed for a declaration that the Patent is invalid, and an order that it be revoked, on the basis of lack of novelty, obviousness and insufficiency.
3. At the trial, the Claimant was represented by Mr Michael Hicks. The Defendant was represented by Dr Geoffrey Pritchard.
4. The relevant legal principles were agreed between the parties, and I have set them out below, but they are well-known. No new points of law were raised. This is therefore a case which turns entirely on its facts.

Introduction to the Technology

5. When constructing a railway track, a foundation, called a trackbed, is built, on to which the railway track is laid. Typically, the trackbed comprises a 300mm to 500mm deep layer of ballast, made of graded, crushed rock aggregate. The ballast is laid onto the soil (called the subgrade). By way of example, Figure 1 of the Patent is shown here, with the rails (16 and 18) placed on the ballast (20) which is in turn placed on the subgrade (22):

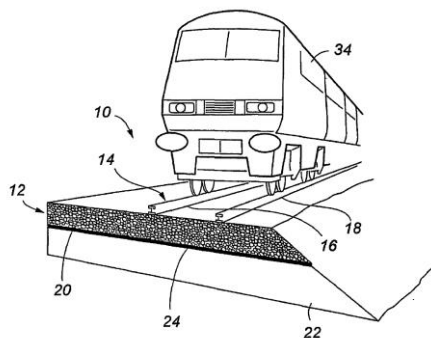
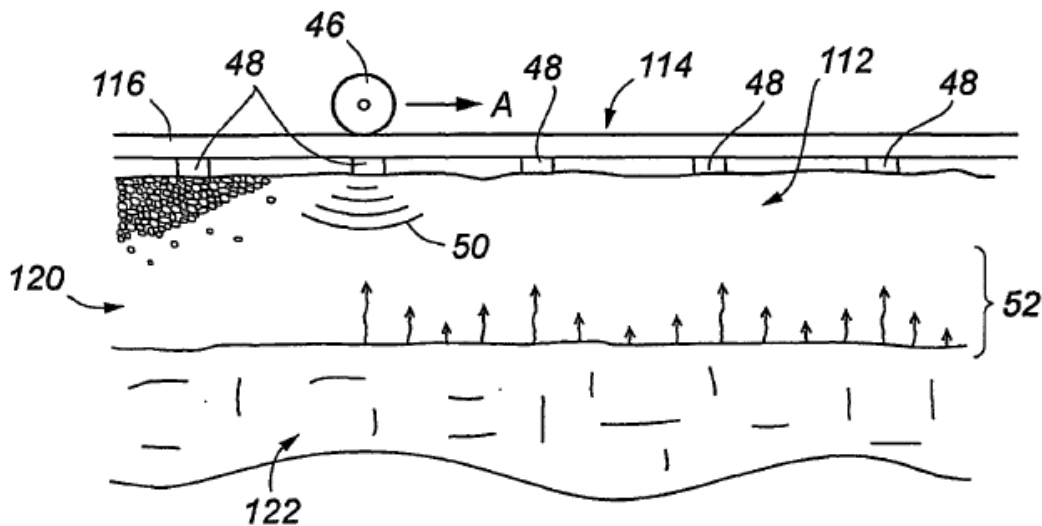


Fig. 1

6. The nature of the subgrade will depend on the local geography. Approximately 10% of the United Kingdom’s rail network is laid on a subgrade with a high clay and silt content, such as London Clay or Oxford Clay. Clay subgrades can vary in moisture content – when very dry, they can take on the strength of a house brick, but when very wet, they can become a slurry. The pores of the clay can contain water, which can remain in the subgrade even for decades. When it rains, water passes down through the ballast until it reaches the subgrade, and this can, over time, cause a liquid slurry to form on the upper surface of the subgrade.
7. When a train passes over a track which has been laid over clay subgrade, a short-lived heavy load is transmitted downwards via the ballast to the subgrade. A train has many wheels: therefore a rapidly repeating heavy load is applied. This will tend to cause the pore water to be squeezed out of the clay. This can lead to pumping erosion: as the pore water is forced out of the subgrade, it carries with it fine particles of clay and silt. Over time, the removal of the clay and silt particles causes erosion to the trackbed, and settling of the track. By way of example, Figure 5 from the Patent is shown here,

and shows a vertical cross-section through a typical railway track with the cross-section running lengthways down the track. The tracks (116) are placed on sleepers (48), which are placed on ballast (120), which is placed on the subgrade (122). As the train (46) passes over (A), pumping erosion (52) occurs:



8. The end result of pumping erosion is shown in this photograph taken from the evidence of the Defendant's expert in this case, Professor Terry Ingold. The slurry has migrated up through the ballast, such that it is "daylighting".



9. The problem of pumping erosion has long been well known. Traditionally, it was addressed using a 100mm to 150mm layer of sand, placed between the subgrade and the ballast. The sand acted as a filter, slowing the passage of water, and trapping the fine clay and silt particles. But sand had known disadvantages, primarily because it was expensive and inconvenient to lay. Finding a replacement was therefore desirable. Thus, instead of sand, various synthetic trackbed liners have been tried. The Patent, alleged infringement (Hydrotex) and prior art in this case all concern such synthetic liners.
10. The Patent was filed on 13 May 2010. The Claimant's product, Tracktex, was launched in around 2010. Whilst the Claimant submitted that Tracktex is made to the Patent, the Defendant contested this. I return to this issue below.
11. The Defendant's product, Hydrotex, was launched in around 2012.

12. At trial, the Defendant relied on two pieces of prior art. The first was WO 95/04190 filed on 26 July 1994 titled “Improvements in or relating to pavements” (“Hoare”). Hoare refers expressly to GB 1 355 373 “Porous materials derived from tetrafluoroethylene and process for their production” filed on 21 May 1970 (“Gore”). The Defendant submitted that the Patent is anticipated by Hoare, including the express reference to Gore. In the alternative, if the Patent is not anticipated by Hoare, it is obvious over Hoare.
13. The second piece of prior art was relied on by the Defendant only in relation to obviousness: GB 2 356 880 “Rail support structures and geosynthetics” filed on 1 December 1999 (“Jay”). A third pleaded piece of prior art, GB 2 447 797 “Railway track bed composite structural element” filed on 2 March 2007 (“Jay 2”) was not relied on at trial.
14. In addition to anticipation and obviousness, the Defendant also claimed that the Patent is invalid for insufficiency.
15. I return to each of these issues below.

Procedural Matters

16. At the start of the first day of the trial, I was asked to determine two applications:
 - (a) an application by the Claimant by application notice dated 30 November 2019 to admit into evidence three witness statements, being a third witness statement of its expert, Mr Thomas Sangster, a second witness statement of Mr Gordon Donald and a witness statement of Dr Philip Sharpe (supported by a witness statement of the Claimant’s solicitor, Mr James Love). The Claimant also sought an order in the following terms:

“The Defendant may not contend at trial that its Hydrotex 2.0 product which is the subject of this claim and its Product and Process Description (“PPD”) dated 28 May 2019:

 - (i) is not permeable to liquid water under the load of a train.
 - (ii) [t]he “innermost layer” does not in use act as a filter to clay particles”; and
 - (b) an application by the Defendant by notice dated 1 December 2019 to admit into evidence a third witness statement of its expert, Professor Ingold. That application was supported by a witness statement of the Defendant’s patent attorney litigator, Mr David Croston.
17. The parties accepted that both applications required relief from sanctions in relation to the witness statements, given that the dates for filing evidence in the proceedings had long passed.
18. The Claimant’s application was said to arise from non-infringement arguments which it said were raised for the first time in the Defendant’s skeleton argument. The Defendant’s application was said to be in response to the Claimant’s application.
19. It also quickly became clear during the course of the first morning of the hearing that the Defendant wished to amend its PPD, and it eventually sought permission to do so (which also required relief from sanctions). However, by the end of the first day of the hearing, it had not reduced the proposed amendment to writing. The Claimant’s position on the Defendant’s proposed amendment therefore could not be ascertained.

20. In any event, prior to the start of the second day of the trial, I was informed that the parties had reached an accommodation in relation to the two extant applications and the proposed application to amend the PPD, as follows:
- (a) each party consented to the other adducing an additional witness statement from the other's expert;
 - (b) the Claimant consented to the Defendant's application to amend its PPD;
 - (c) the Defendant consented to the admission into evidence of the second witness statement of Mr Donald and the witness statement of Dr Sharpe; and
 - (d) the Defendant conceded paragraph (ii) of the order requested by the Claimant – that is, that it not be allowed to run as a defence to infringement an argument that the inner layer of Hydrotex does not act as a filter to clay particles.
21. I therefore granted relief from sanctions and made orders in the terms agreed by the parties. However, this was a most unsatisfactory way in which to begin the trial. Had the parties not been able to agree, it would have been likely that the trial would have needed to be postponed, with the attendant costs, and disruption to other litigants. I am grateful to the parties for reaching an accommodation, so that the trial could finish in the allocated time. I return below to the impact of the amendment of the PPD.
22. In addition to damages or an account of profits, the Claimant also claimed damages pursuant to Regulation 3 of the Intellectual Property (Enforcement etc) Regulations 2006 and Article 13 of Directive 2004/48 of the European Parliament and of the Council of 29 April 2004 on the Enforcement of Intellectual Property Rights. The parties asked me not to make any findings in that regard on the basis that any findings could be made at any trial on quantum, following any finding of infringement.

Experiments

23. Experiments were conducted by permission of Nugee J granted on 23 October 2018. The experiments tested specimens of Hydrotex according to BS EN ISO 11058:2010 (Geotextiles and geotextile-related products – determination of water permeability characteristics normal to the plane, without load) using what was described as the “constant head” method, with a head loss of 50mm and of 280mm. In short, the experiments sought to test the permeability of Hydrotex to water placed above it at a depth of 50mm and at a depth of 280mm.
24. The Claimant accepted Professor Ingold's summary of the position as follows:
- “Hydrotex has a WEP [water entry pressure] somewhere between 0.5 kPa (a 50mm head of water) and 2.7 kPa (a 280 mm head of water). Liquid water would not be expected to flow through Hydrotex at an applied water pressure below its WEP but would be expected to flow at an applied water pressure at, or greater than, its WEP.”
25. Whilst criticisms were levelled at the experiments, in light of that concession, I need say no more about them.

PPD

26. As mentioned above, the PPD was amended on the second day of the trial: I set out below paragraphs 4 to 11 of the Amended PPD, with the amendments shown:

- “4. Hydrotex 2 comprises a five component laminated structure. It is produced in rolls of varying lengths and widths. It is intended for use as a railway trackbed liner.
5. The innermost layer in the laminated structure is a bi-component, 80gsm, 85% polypropylene core, 15% polyethylene sheath spun-bonded, non-woven sheet material (A). This layer is calendered with a hot roller to reduce the pore size to that required for clay particle filtration. The mean pore size is 4 microns around a standard distribution with a typical range of pore sizes from 0.06 to 7.0 microns.
6. On either side of the innermost layer, an intermediate layer comprises a 30gsm high density polyethylene spun-bonded, non-woven material (B) – Aspun 6834.
7. An outermost layer on opposite sides of the intermediate layers comprises an 800gsm polypropylene, non-woven, needle punched material (C).
8. The innermost layer A is glued to the intermediate layer B by means of an EVA hot melt adhesive powder (D) to form a sub-assembly.
9. The outermost layer (C) is flame laminated on to opposite sides of the sub-assembly.
10. The innermost layer (A) is permeable to liquid water both by itself and when assembled into the completed product. The completed product, [when tested in accordance to ISO 11058](#), is permeable to liquid water in the absence of the load [equivalent to ~~of~~](#) a vehicle acting on the trackbed and under the load [equivalent to ~~of~~](#) a vehicle acting on the trackbed.

[10A. Outside this litigation the Defendant has no knowledge of the permeability characteristics of its product in use as a trackbed \(i.e. other than tests made in accordance with ISO 11058\).](#)

[10B. The defendant believes that in use water is never permitted to pass upwardly through the filtrate layer because instead it passes laterally out through the support layer.](#)

11. The intermediate and outmost layers B, C are liquid water permeable.”
27. The original PPD was signed on 28 May 2019 by Dr Paul Wormald, the Product Development Manager at the Defendant responsible for Hydrotex. Dr Wormald has a PhD in polymer chemistry, and has been involved in product development and technical management for nearly 30 years. The Defendant conceded that there was no-one else employed by the Defendant with better knowledge. It was further conceded that it was Dr Wormald’s role to ensure Hydrotex satisfied Network Rail’s requirements.
28. At the time he signed the original PPD, this action had been on foot for over a year, but Professor Ingold had not yet been instructed as the Defendant’s expert witness.
29. Dr Wormald also signed the Amended PPD (on 3 December 2019, the first day of the trial) and attended court at short notice to be cross-examined on the second day of the trial. The signed Amended PPD was handed up on the second day of the trial. Under cross-examination, Dr Wormald

did not stand firmly behind the Amended PPD. He stated that, having initially signed the original PPD, he had changed his mind as to the operation of Hydrotex having read Professor Ingold's expert report (the first of which was signed on 30 September 2019). Dr Wormald did not explain why there was a delay in correcting the PPD, but his answers relating to Professor Ingold's theory of how Hydrotex works (to which I return below) were equivocal at best:

“Q. Now, can I ask you when you changed your mind as to the way Hydrotex worked?

A. After considering Professor Ingold's report, it may be that we see lateral movement of water in the product. I have no experimental evidence to bear that out as I sit here today.

Q. So you are saying it is a possibility?

A. Yes.

Q. But the other possibility is that it works?

A. Yes.”

30. Later, Dr Wormald was asked whether the Defendant had notified Network Rail of its change of position in relation to Hydrotex, changed its on-line advertising, or withdrawn the product from sale. He answered as follows:

“Q. So, the failure of the company to take these steps suggests, does it not, that you, personally, and the company as a whole, probably take the view that Hydrotex works in the way described in the literature, namely slurry is pushed up against the filter layer and is filtered?

A. We think that may be the main mechanism, but in the report put together by Professor Ingold, another mechanism has been proposed that may be contributing to the way the material works.”

31. In his closing submissions, Counsel for the Claimant submitted that Dr Wormald may be criticised for signing the Amended PPD but commended for the fact that he corrected the position in cross-examination. I agree. It is clear to me from what he said in cross-examination and the way he said it that he was not fully behind at least paragraph 10B of the Amended PPD, stating that it was one option put forward by Professor Ingold which he had no data to support. When the way in which Hydrotex was said to work in the original PPD was put to him, he responded “We think that may be the main mechanism”. By “we”, I take him to mean the Defendant.

32. Submissions were made as to whether Dr Wormald was an expert. He was not presented as one, and I accept that. Further, the Defendant had no permission for a second expert. But Dr Wormald is clearly a highly qualified professional, and he was put forward by the Defendant as its witness of fact on how Hydrotex works. This undermines the Defendant's submission in closing that “neither party can place too much weight on what Dr Wormald said”. In my judgment, Dr Wormald's version of events in court was more reliable than the Amended PPD that he was asked to (and did in fact) sign. It is clear to me having watched him give evidence that he noted Professor Ingold's theory, but continued to believe that the “main” mechanism for Hydrotex's operation was that previously set out in the unamended PPD, and I consider that the Claimant is entitled to rely on that evidence. Dr Wormald was in court a “clear and honest witness” (as the Defendant submitted), and I accept his evidence in court as to how Hydrotex works.

33. I return to Professor Ingold's theory below.

Witnesses

34. The Claimant relied on the following witness statements:
- (a) Three reports of its expert, Mr Sangster, signed 30 September 2019, 23 October 2019 and 29 November 2019;
 - (b) Two witness statements of Mr Donald signed 18 June 2019 and 29 November 2019; and
 - (c) A witness statement of Dr Sharpe signed 29 November 2019.

Mr Sangster was cross-examined: I return to his evidence below. I accept the evidence of Mr Donald and Dr Sharpe who were not cross-examined.

35. The Defendant relied on three reports of Professor Ingold, signed 30 September 2019, 23 October 2019 and 20 November 2019. Professor Ingold was cross-examined. As noted above, Dr Wormald was also cross-examined, and I have set out my findings as to his evidence above.
36. The parties also relied on a joint expert report, dated 12 November 2019.
37. I set out below my analysis of the two expert witnesses' evidence.

The Patent

38. The Patent is directed to a geosynthetic trackbed liner made of a “filtration layer” sandwiched between two “support layers”. Its disclosure is said to relate to a solution of the known problem of pumping erosion, referred to above.
39. At [0001] to [0004] the Patent discusses pumping erosion, and the use of a layer of sand as a means of combatting the known problem. The additional costs of using sand are noted. Then at [0005] to [0007], the Patent refers to two previous attempts to find a geotextile-based solution to pumping erosion. The first is not relevant. The second is Jay – which describes a liner consisting of an impermeable membrane between water permeable layers. The Patent notes at [0007]:
- “The geocomposite disclosed in [Jay] does not adequately address the problems of pumping erosion, because the impermeable nature of the geomembrane is such that water cannot pass upwardly through it. Passage of a train along the support structure tends to ‘squeeze’ ground water in the subgrade laterally outwards, carrying solids particles and eroding the track structure.”
40. At [0011] the Patent discusses “at least one filtration layer being of a material which is normally impermeable to liquid water, which should be taken to mean that the material is impermeable to liquid water in the absence of the load of a vehicle acting on the trackbed.” This is said to have the advantage that rainfall does not pass down through the filtration layer into the subgrade.
41. At [0012] the Patent discusses the impact of the filtration layer “substantially” preventing the passage of any solids materials, so as to avoid any significant pumping erosion.
42. At [0013] the Patent suggests several types of material that may be appropriate, being products which are vapour permeable but not liquid water permeable – one of which is GORE-TEX, a product commercially available then and now and which is used for clothing, and allows perspired water vapour from the body to pass outwards through it, but does not allow liquid water rain to pass inwards through it.

43. At [0018] and [0019] the Patent refers to upper and lower support layers either side of the filtration layer. The support layers are to protect the filtration layer from being pierced or otherwise damaged by the ballast. They may have “a relatively high water permeability”.

44. At [0020] the Patent notes:

“The at least one filtration layer may be normally impermeable to liquid water, but may become permeable on application of a sufficiently high pressure to a surface of the filtration layer.”

45. At [0051] the Patent introduces the Figures. I have set out Figures 1 and 5 above.

46. At [0054] the Patent notes:

“Water flows from the subgrade because the pressure exerted upon the [trackbed liner] (and thus upon the filtration layer) as the train passes over each sleeper of the track is sufficiently high to force liquid water upwardly through the pores of the filtration layer and into the ballast...

However, following passage of the train, when the pressure acting on the filtration layer reduces (and is then due only to the load exerted by the trackbed and track), the filtration layer once again becomes impermeable to liquid water.”

47. At [0056] the Patent puts values on the two pressures – with and without the load of a train:

“Typical static loading on the filtration layer (due to the ballast and track) would be less than 10kN/m^2 , and may be approximately 2.9kN/m^2 for a typical track having a 300mm depth of ballast of density around 1000kg/m^2 .

The peak vertical dynamic stress during the passage of a train would typically be around 10kN/m^2 and may be between 10kN/m^2 and 100kN/m^2 , depending on factors including train axle load, ground stiffness and track type.”

48. The parties agreed that all aspects of the case stand or fall with Claim 1 – I therefore set it out in full, adopting the numbering of the integers used by the Claimant, with which the Defendant did not disagree:

“A trackbed liner comprising:

- 1.1 an upper support layer;
- 1.2 a lower support layer; and
- 1.3 at least one filtration layer of a material having a plurality of pores
- 1.4 and which is normally impermeable to liquid water, that is in the absence of the load of a vehicle acting on the trackbed,
- 1.5 the filtration layer located between the upper and lower support layers;
- 1.6 in which the pores of the filtration layer are dimensioned so that, in use and under load of a vehicle acting on the trackbed, the filtration layer
 - 1.6.1 permits passage of liquid water upwardly therethrough but

1.6.2 restricts the passage of solids materials, so as to restrict pumping erosion of material located beneath the liner.”

49. In its interpretation of Claim 1, the Claimant relied on three other claims, which I therefore set out in full:

“Claim 3: A liner as claimed in either of claims 1 or 2, wherein the pores have a maximum dimension of no more than about $2\mu\text{m}$ ($2 \times 10^{-6}\text{m}$).

Claim 4: A liner as claimed is either of claims 1 or 2, wherein the at least one filtration layer is microporous, having pores with a maximum dimension of less than or equal to around 2nm ($2 \times 10^{-9}\text{m}$).

...

Claim 11: A liner as claimed in any preceding claim, wherein the at least one filtration layer is of a material which is normally impermeable to liquid water, but which becomes permeable on application of a pressure of at least about 10kN/m^2 thereon.”

Skilled Addressee and Common General Knowledge

50. Prior to the trial, both parties’ counsel indicated that the identity of the skilled addressee and the state of the common general knowledge (“CGK”) were agreed. However, each party stuck by the words it used to describe each. Those words differed – although it was not clear how significantly they differed in substance. It took some prompting from me over the course of the hearing to ensure that the agreement the parties’ had reached was to a single set of words used to describe each. In the end, I read onto the transcript on the final day of the hearing my understanding of the skilled addressee, and neither party objected. The parties filed an agreed statement of the CGK on 2 January 2020.

51. As I said in *Clearswift Limited v Glasswall (IP) Limited* [2018] EWHC 2442 (Pat), there is limited utility in parties saying they are agreed on the skilled addressee/CGK without saying, in words, who the skilled addressee is and what the CGK is. Judges need to write judgments – this involves setting out who the skilled addressee is, and what the CGK is. It is no good for the parties simply to say that they agree: it is incumbent on them to express, in terms, what that agreement is, preferably before the trial. If it cannot be done before the trial, it should be done shortly after the conclusion of the evidence. Importantly, where minor differences subsist after the evidence, it will be of significant help to the court if they are summarised, along with why it makes a difference. The court can then rule on the differences based on the evidence. If the lack of agreement on a minor aspect makes no difference, then it should be ignored. What is important is that where the skilled addressee and/or the CGK are agreed, the court has a clear statement of who the agreed skilled addressee is, and what the agreed CGK is.

52. In this case, the skilled addressee was agreed to be:

“A professionally qualified geotechnical engineer with several years’ post graduate experience and knowledge of railway trackbed design and of the availability, design, manufacture and performance of geosynthetic materials.”

53. The CGK was agreed to be:

“(a) The recognised problem of pumping erosion including that it is caused by the passage of a train over subgrade which is wet and which as a result forms a slurry.

- (b) The conventional way of making a trackbed utilising a layer of sand to combat pumping erosion.
- (c) The time and cost of installing an appropriate layer of sand.
- (d) The potential to use geosynthetics in rail applications.
- (e) The fact that geosynthetics can be permeable geotextiles or impermeable geomembranes.
- (f) The combination of geosynthetic layers to form a geocomposite.
- (g) The use of geosynthetics in a trackbed liner for separation, waterproofing and reinforcement.
- (h) Knowledge of the concepts of water entry pressure (WEP), pore size and permeability and how to vary them in geotextiles.
- (i) Knowledge of EN11058 as an established method of testing the permeability of geotextiles.
- (j) Darcy's equation and its application to water movement.
- (k) Characteristics of soils, their particle size distribution and its effects. This would include the particle size ranges of clay, silt, sand and gravel; that clay and silt are cohesive; that water cannot drain from them rapidly even under load; and that when it does so it can transport with it fine soil particles.
- (l) That clay particles suspended in water are transported easily in the water column, and in particular more easily than silt particles.
- (m) Knowledge of Network Rail specification RT/CE/S/071 Design of Earthworks and Earthworks Remediations. The skilled person would have access to a copy and refer to it as necessary.
- (n) 1986 Paper by D. J. Ayres ("Ayres' Paper") entitled "Geotextiles or Geomembranes in Track? British Railways' Experience" which includes the following:
 - (i) A discussion of the well-known problem of pumping erosion and the use of sand (page 131).
 - (ii) British Railways ("BR") [the predecessor of Network Rail] had for some years used a standard design with a geomembrane placed in the middle of the layer of sand with success (pages 131/132).
 - (iii) That despite optimistic claims, BR had found that geotextiles alone would not solve the problem. Slurry can pass through them. Geotextiles are "useless" as a permanent replacement for sand, but their delaying effect might be reviewed (page 132 and 135 to 138).

- (iv) “No geotextile commercially available in the world has been found which can prevent the passage of clay and silt particulars under dynamic loading.” (page 141).”

What is not in the Patent

54. The Defendant relied for its insufficiency case on the lack of teaching in the Patent. It is therefore convenient to note at this point four issues which the Defendant said (and Mr Sangster accepted) were not dealt with in the Patent:
- (a) there is no scientific theory in the Patent which explains how it is to be made to work (and no theory relating to clogging or blocking);
 - (b) there are no data in the Patent which tell the skilled person if a product was made which worked;
 - (c) no data are provided in the Patent to enable the skilled addressee to form a view on whether the invention in the Patent works or not; and
 - (d) the skilled person cannot in any event work out whether or not a product infringes *in situ* without more data about the site at which it was laid.

The Expert Witnesses

55. Before turning to a discussion of the two expert witnesses, I reiterate Jacob LJ’s comments in *Rockwater Ltd v Technip France SA and Anor* [2004] EWCA Civ 381 at para 12:

“I must explain why I think the attempt to approximate real people to the notional [person] is not helpful. It is to do with the function of expert witnesses in patent actions. Their primary function is to educate the court in the technology – they come as teachers, as makers of the mantle for the court to don. For that purpose it does not matter whether they do not approximate to the skilled [addressee]. What matters is how good they are at explaining things.”

56. Both expert witnesses were good at explaining things. Both fulfilled the role of teacher, and both were seeking to help the court. But, as is often the case, both experts were way beyond being substitutable for the skilled addressee as at the priority date – both are significantly more skilled, accomplished and imaginative than the skilled addressee, and both have the benefit of having read the Patent, and of hindsight. This led to a tendency for more detailed thinking than would ever, in my judgment, have occurred to the skilled addressee, who, as agreed, has only “some” relevant experience. I have therefore treated with some caution the evidence of both experts and, where relevant, set out my findings on specific issues below.
57. Criticism was made by the Defendant of Mr Sangster’s evidence, which was described as “far from frank” and as having “the distinct flavour of a man wishing not to be caught out in a mistake he had made”. I was not asked to make an adverse finding, but I was asked to prefer Professor Ingold’s evidence to Mr Sangster’s where they disagreed. In particular, Mr Sangster’s evidence was criticised as follows:
- (a) It was submitted that he had not stated in his expert reports that he knew and had worked with the inventor of the Patent, Mr Andrew Leech, and that he failed to mention that he was aware of the Patent, Hydrotex and Tracttex prior to the litigation. Mr Sangster was said to be careless or evasive or both. This was a general attack on his credibility, which I reject. I did not find his evidence before the court to be careless or evasive. Further, no specific part of his evidence was called into question on the basis of alleged bias. In any event, Mr

Sangster had disclosed his prior involvement with the Defendant (for whom Mr Leech had worked at the time) – so this cannot have been unknown to the Defendant. I accept that the industry is a small one, and the players in it are likely to be known to one-another.

- (b) Equally, I do not accept the criticism of Mr Sangster that he did not deal early enough with the issue of insufficiency, that is, the Defendant’s case that water would only flow laterally, rather than being forced through the filtration layer. I accept the Claimant’s position that it had not been made clear by the Defendant that Hydrotex did not work as advertised: once Professor Ingold’s report was received, and his theory articulated, Mr Sangster responded. I did not find Mr Sangster’s responses to questions in cross-examination to be “ludicrous”: to the contrary, I found his explanation cogent, in circumstances in which it emerged rather late that the Defendant’s position was contrary to its public advertising of its own product.
- (c) Mr Sangster was also criticised for raising late the presence of slurry under the geotextile. I return to this issue below, but for present purposes I need only note that I found his evidence on this point to be credible and cogently explained.

58. I therefore consider Mr Sangster to have been a good witness.

59. As the Claimant noted in its closing skeleton argument, Professor Ingold’s theory was at the cornerstone of the Defendant’s infringement and insufficiency case. I therefore need to discuss his evidence in detail.

60. Professor Ingold’s theory, put simply, was that a product made in accordance with the Patent will never work – slurry will never pass through the filtration layer so as to be filtered. Instead, his evidence was that slurry will always move laterally under the load of a train, travelling through the lower support layer towards the edges of the geomembrane, where it will be disgorged into drains. The path of least resistance for the slurry under the load of a train is never through the filter, he said, but always laterally. If Professor Ingold is correct, then a product made to the Patent functions relevantly identical to the invention set out in Jay. Jay did not attempt to filter the slurry, but rather to divert it laterally to drains at the side of the track. A geomembrane which does not filter but diverts the slurry laterally towards drains has the advantage of not allowing rainwater into the subgrade, but it does not avoid pumping erosion.

61. Professor Ingold agreed under cross-examination that his theory was based on theoretical considerations. He considered the University of Birmingham test (to which I will return) to be consistent with his theory, but he was unaware of any other tests or experiments on Hydrotex which supported his theory. Professor Ingold also accepted in cross-examination that the mechanism of what is actually happening in a trackbed liner is “very complicated” – he agreed that it was impossible to calculate mathematically exactly what is happening.

62. There was, however, other evidence before me that was, in my judgment, inconsistent with Professor Ingold’s theory:

- (a) The Defendant’s sales literature: A print-out from the Defendant’s website promoting the Hydrotex product was in evidence before the court. The document states:

“TERRAM Hydrotex provides a permanent way solution for trackbed stability that not only acts as a filter/separator for fine soils, but also removes the requirement for a sand blanket.

TERRAM Hydrotex nonwoven composite consists of a central filter media thermally bonded to two opposing needle-punched nonwovens (robust filters) to create a geocomposite with sufficient strength and protection to be durable to the abrasion and point loading of ballast.

The traditional use of a sand blanket in railway trackbed uses a sub-ballast and/or a graded-sand layer to prevent the upward movement of fine sub-grade particles while allowing effective drainage and dissipation of pore water pressure. TERRAM Hydrotex offers this solution in one geocomposite.

...

Features:

- Prevents upwards particular passage smaller than 0.002mm
- Permeable filter, allowing upward and downward water transmission
- Replaces the requirement for a sand blanket
- ...
- Approved by Network Rail
- Residual slurry becomes desiccated as any pore water is dissipated”

The Defendant’s witness Dr Wormald was asked if this literature had been withdrawn from the Defendant’s website in light of Professor Ingold’s theory that the Hydrotex product did not prevent pumping erosion: he said that it had not. Indeed, there was no evidence before me that the Defendant had done anything to correct its public position that its Hydrotex product works in accordance with its literature, ie that it prevents pumping erosion;

- (b) Network Rail’s approval of Hydrotex: Hydrotex was supplied to Network Rail pursuant to an invitation to tender which was before the court, which provided:

“2.4.3 Provision of Anti-pumping Geo-composites

All anti-pumping geo-composites used in the trackbed shall meet the following minimum requirements:

1. Have the ability to prevent the migration of any clay fines from the subgrade into the ballast layer above.
2. Be permeable under normal traffic loadings to ensure pore pressure are dissipated.”

Similar requirements are repeated in Network Rail’s certificate of acceptance for Hydrotex:

- Must have the ability to prevent the migration of any clay fines
“ from the subgrade into the ballast layer above.
- Must be permeable under normal traffic loadings to ensure pore pressures greater than 10kN/m² can be dissipated.”

Dr Wormald gave evidence that the Defendant had not contacted Network Rail to alert it to the possibility that Hydrotex does not work in the way in which it had been claimed;

- (c) Dr Wormald: As set out above, Dr Wormald, the Defendant's Product Development Manager responsible for Hydrotex, was asked in court if he supported Professor Ingold's theory. He did not. He maintained the Defendant's earlier position that Hydrotex works by filtering slurry, because, he said, the Defendant has sold a considerable quantity of it. Hydrotex had been used extensively, and Dr Wormald had seen nothing to suggest it did not operate in the way described, other than Professor Ingold's theory. He was unaware of any experimental or other evidence to support Professor Ingold's theory;
- (d) The University of Birmingham test: As mentioned earlier, there was before the court a report dated November 2014 of tests carried out by the University of Birmingham on Hydrotex, put into evidence as an annexure to Professor Ingold's first report. Confidentiality was claimed in the report, and by consent I made an order to that effect. The following recitation is in accordance with that Order. The University had set up a machine to test whether Hydrotex works by, in effect, simulating the effect of a train passing over a track bed. The tests indicated that Hydrotex was filtering slurry under the pressure of a train load, such that filtered water was passing up through the geomembrane into the ballast. Professor Ingold accepted in cross-examination that Hydrotex appeared from the test to work as claimed. Towards the end of the tests, after 2.8 million cycles, something went wrong, and neither of the experts (nor the University of Birmingham) was able to say why Hydrotex had ceased to function in the way claimed. But for the bulk of the test, Hydrotex had worked as claimed – by filtering slurry under a load equivalent to that of a train. Despite the ends of the Hydrotex not being sealed, the test did not cause slurry to travel laterally out the edges of the product. In the Defendant's closing arguments, its counsel reminded me that under cross-examination Professor Ingold had not accepted that his theory was wrong – indeed, he stuck to it tenaciously. But Professor Ingold did say that water had passed through the Hydrotex layer and that larger clay particles had been filtered out during the first phase of the test:

“Q. However, what I suggest this demonstrates to you is that in the researcher's opinion water was passing upwardly through the Hydrotex?

A. Yes.

Q. Which was doing a good job of filtering the slurry?

A. Yes.

Q. And a few clay fines were appearing at the surface?

A. Yes, that is what was happening.

Q. We can see that in the final sentence, "Since minimal amount if any clay migrated through the composite, it passed the test in preventing migration of fines from the subgrade into the overlying ballast"?

A. That is correct, yes.

Q. What I want to suggest to you is that this is consistent with the proposition that in this test Hydrotex was working, as per the patent, slurry was being pushed upwards against the filter, the clay was being largely held back by the filter?

A. Yes.

- Q. And a small quantity of particles were coming through?
- A. At that point, yes.
- Q. So it does appear that the product was working at that point?
- A. At that point, yes.
- Q. That mechanism of working is not consistent with your theory of operation?
- A. No, at that point, as you quite rightly say, the particle fines were going up through the filter layer.”

- (e) I accept that the University of Birmingham test was a high stress test designed for other purposes (to test the fatigue life of Hydrotex) but it is empirical evidence of the fact that, in the circumstances of the test, water passed through Hydrotex under a pressure equivalent to that of a train, and that clay particles were filtered out of it, even if neither expert (nor the University) could explain the mechanics behind that result;
- (f) No reported problems with Hydrotex: It was part of Professor Ingold’s theory that it would take “several years” for it to become apparent *in situ* that Hydrotex was not filtering slurry, but rather passing it laterally. There was no evidence before the court that Hydrotex had shown signs of failing, despite its having been in use over a substantial mileage of railway tracks in the United Kingdom since 2012. Given the promises made in the Hydrotex literature, and Network Rail’s requirement for a product that prevents pumping erosion, I would have expected any such failure to be noticed and raised with the Defendant. It was not. Counsel for the Claimant accepted that on its own, this evidence would not be conclusive, but he submitted it was powerful evidence; and
- (g) No reported problems with Tracktex: The Defendant contested that Tracktex is a product made to the patent. Mr Donald gave evidence to that effect, and he was not cross-examined. Professor Ingold also accepted in Annexure 3 to his first report that an “embodiment of the [P]atent appears to be [the Claimant’s] product Tracktex”. I therefore accept for present purposes that Tracktex is a product made to the Patent. With this in mind, if Professor Ingold’s theory were right, then Tracktex, too, would not filter clay fines from the slurry created by train pressure on the subgrade, but would instead pass the slurry laterally until it is ejected at the edge of the geotextile into the drains. Mr Donald gave evidence that no such problems had been reported, despite Tracktex being available since 2011, and over 150 miles of it having been laid in the United Kingdom. Again, given Network Rail’s requirements, I would have expected it to raise any concerns with the Claimant. It did not.
63. In addition to this empirical evidence, Mr Sangster also gave his views on why Professor Ingold’s theory was not correct. Put shortly, he described Professor Ingold’s theory as akin to a child gently lowering her/his foot into a puddle. In such a circumstance, the water will move sideways, displaced by the child’s foot, but without a splash. The reality of a train passing over a track is, said Mr Sangster, closer to a child stamping in a puddle of water. Rather than being gently displaced, the water goes in several directions, including being propelled upwards.
64. In my judgment, Professor Ingold’s theory is inconsistent with the empirical evidence set out above, and is open to the criticism Mr Sangster made of it. Professor Ingold is a very highly experienced and qualified engineer and academic, and he gave his evidence honestly and at times passionately. However, he admitted himself that he could offer no proof of his theory through experiments or other methodology, so it remains a theory. As the theory is inconsistent with the empirical matters referred to above, I am unable to accept it. In doing so, I mean no disrespect to Professor Ingold – he

came to court to explain the technology, and it is clear his theory was firmly and honestly held. But his theory is inconsistent with other, empirical evidence before the court and was criticised by Mr Sangster, and I reject it.

65. I also need to say something about clogging and blocking. Mr Sangster did not propound a theory in relation to the Patent or Hydrotex, but he was asked a series of questions about how a product made to the Patent might work. He suggested, and I put it no more highly than that, that slurry would be forced through the filtration layer when that was the path of least resistance. He suggested that this “might” happen once the support layers were clogged or otherwise blocked but he expressly rejected that this “will” happen. I did not understand him to be propounding this as a theory – rather, the information was amongst his comments in his reports and in his answers that emerged in cross-examination. The Defendant sought to rely on Mr Sangster’s comments in a number of ways, but that reliance was, in my judgment, misplaced because Mr Sangster never actually said what the Defendant’s counsel suggested he said. He did not propose a clogging/blocking theory on how the Patent works.
66. Ultimately, I do not need to make findings on what exactly is going on beneath Hydrotex. I have rejected Professor Ingold’s theory that Hydrotex functions like Jay. Both experts agreed that the mechanics of what is going on are very complicated. I accept Mr Sangster’s evidence that slurry would be “moving in all sorts of directions”. Developing a mathematical model of general application is therefore difficult, if not impossible. I also accept Mr Sangster’s evidence on the presence of at least some slurry under the geotextile. This case, and the products in it, are, as I have said, all about trying to prevent pumping erosion. Pumping erosion is only relevant if there is water present which can carry clay fines: that is, slurry. If there is no moisture, pumping erosion is not an issue, and the issue of clay fines moving up through the ballast does not arise. I have therefore treated very carefully the evidence of mathematical calculations in the absence of the features present under the geotextile. As one example only, Mr Sangster was asked questions about lying in a tent and firing a water pistol at the roof of the tent. This was put to him as an analogous situation to what is happening under the geotextile. It is not. As Mr Sangster said in his evidence, the analogy would be closer if the tent were full of slurry. There was evidence that only small quantities of water are pushed out of the subgrade each time the wheel of a train passes. I can only say that if there is no water, or only “infinitesimally small squirts” as the Defendant’s counsel put it in closing, then the issue of pumping erosion does not arise. Pumping erosion was clearly a known problem for decades. The opening paragraph of the agreed CGK reads “[t]he recognised problem of pumping erosion including that it is caused by the passage of a train over subgrade which is wet and which as a result forms a slurry” (emphasis added). I therefore accept Mr Sangster’s evidence that there is sufficient slurry under the geotextile for the geotextile to be needed. It does not matter for the purposes of the Patent how the slurry came to be there: all the evidence over many decades points to the presence of slurry.

Interpretation of the Patent

Interpretation – the law

67. The parties agreed that patent claims are to be construed purposively: I must read the Patent through the eyes of the skilled addressee and identify what the words of the claim would mean in their context to such an addressee. The context includes the very purpose for which the document exists – to describe and claim an invention. Both parties referred me to the judgment of Lord Kitchin JSC in *Icescape Limited v Ice-World International BV* [2018] EWCA Civ 2219. The Claimant also relied on what was said to be the “standard drafting practice for there to be a hierarchy of claims”, such that it was submitted that I should conclude that an earlier claim is wider than a later subsidiary claim.
68. I was also referred by the Claimant’s counsel to *Milliken Denmark AS v Walk Off Mats Limited and Anor* [1996] FSR 292 per Jacob J (as he then was) as an example of the correct approach to interpretation of a claim which required the back of a floor covering to be “water impermeable in

normal use”. However, counsel for the Claimant also conceded that the judge’s findings of fact in *Milliken* are not binding on me as to the proper interpretation of the meaning of the Patent in this case, useful though *Milliken* may be in demonstrating the proper *approach* to construction (albeit, as the Defendant’s counsel pointed out, there have been several authoritative statements of the law since that judgment).

69. In any event, counsel for both parties agreed that, in the end, construction of the Patent is a matter for the court, putting on the mantle of the skilled addressee.

Interpretation - “normally impermeable to liquid water, that is in the absence of the load of a vehicle acting on the trackbed”

70. There was an issue between the parties as to the meaning of “normally impermeable to liquid water, that is in the absence of the load of a vehicle acting on the trackbed” in integer 1.4 of the Patent. The Claimant put its case thus:

- (a) The skilled addressee would appreciate that the invention is for a product for use on railway tracks – that is, for use in rugged conditions over a long distance;
- (b) In this context, it would not be sensible to interpret “normally impermeable” as meaning no measureable water will ever pass downwardly under any circumstances, but rather that for practical railway purposes, the invention avoids the practical problem of rainwater passing into the subgrade under normal conditions;
- (c) Normal conditions are where the “head” of water above the membrane is 50mm or less – any greater amount of water would constitute a flood, and would not be considered “normal”;
- (d) Thus, integer 1.4 of the Patent simply means that the filtration layer resists rainwater (or water that has been permitted to pass upwards through it) from passing down through the filter and into the subgrade below. In contrast, integer 1.6 of the Patent means that when a train passes overhead, the filter can permit water, but not clay, to pass upwardly through it; and
- (e) The weight of the track and ballast has nothing to with this assessment.

71. The Claimant also relied on claim 11 of the Patent, set out above, which refers to a specific number, as a clue to the skilled addressee that the Patent is not talking about absolute numbers, but what might be considered “normal” use.

72. The Defendant submitted that the claim means that the geotextile must be impermeable to water when exposed to a water pressure equivalent to that which would be created by the load of a track and ballast, but permeable to water under the load of a train. The Defendant therefore submitted that a purposive construction of the claim means that “permeable to water” is synonymous with “at a pressure above the water entry pressure” and impermeable to water is synonymous with “at a pressure below the water entry pressure”. The Defendant relied on [0056] of the Patent, which puts values to the load applied (a) by the track and ballast alone and (b) when a train passes. This, the Defendant submitted, makes clear that the skilled person is supposed to be comparing the pressure of the track/ballast load versus the track/ballast/train load. Further, the Defendant submitted that the Patent makes no reference to determining permeability by reference to the height of water above the trackbed. Thus, it described the Claimant’s construction as “deeply unattractive”: if the patentee had wanted to say that the filtration layer would be permeable under a certain head of water, it would have said so.

73. Considering the Patent through the eyes of the skilled addressee, and applying a purposive construction, in my judgment “normally impermeable to liquid water, that is in the absence of the

load of a vehicle” means what it says – in “normal” conditions, the filtration layer will not allow water to pass through it. At [0011], the Patent sets out the reason for this: so that rainwater, and water which has passed up through the filtration layer, will run off to the sides rather than passing (back) down through the filtration layer into the subgrade. The skilled addressee will appreciate that the product is to be used on a railway track. Those “normal” conditions are therefore when in use as a geotextile under ballast and above subgrade as part of a railway track. The “normal” conditions include the weight of the ballast, sleepers and rails (but not a train). They also include the presence of rainwater (including any water that has been permitted to pass upwardly through the filtration layer), but not a flood – the experts both accepted that under normal conditions, water would not pool on top of the geotextile in substantial quantities because of the way in which railways are constructed. (I say something further below about what were described as “bathtubs” of water resting on the filtration layer). The Patent does not refer to stands of water, but the experts agreed that (subject to “bathtubs”) a stand of water of greater than 50mm would not be normal, because stands of water would only arise in unusual (ie, not “normal”) flood conditions. I do not consider that the skilled addressee would assess permeability from above in light of the pressure applied by the track and ballast. As the Patent sets out at [0056], the load of the track and ballast (but not a train) would be approximately 2.9kN/m². This is the pressure applied on the top of the geotextile by the weight of the ballast, sleepers and track. It is not the pressure applied from above by water, which the experts agreed will pass between the graded, crushed rock aggregate, and will run off to the sides (subject to “bathtubs”). Further, the skilled addressee, being aware of the rugged circumstances of the use as a trackbed line, would not care if small amounts of water passed through: the requirement for impermeability is not absolute. I therefore reject the Defendant’s interpretation and accept what both experts agreed: in normal conditions (less than 50mm head of water), water will not pass through the geotextile from above. I return to “bathtubs” below.

Interpretation - pore size

74. There was also a dispute between the parties as to whether or not there is in the Patent an implicit limitation in claim 1 to a pore size of 2µm or less. The Defendant said that there is, and took its position from [0013] of the Patent:

“[t]he pores may have a maximum dimension which is no more than about 2µm ... Pores having a maximum dimension of up to 2µm may be sufficient to prevent or at least substantially restrict passage of clay solids particles (or at least a majority of such particles), which are typically considered to have an average size of up to around 2µm.”

75. The Claimant resisted this interpretation on the following four bases:
- (a) The relevant claim of the Patent, claim 1, does not contain any limitation on pore size of the filter layer, other than the functional limitations set out in integers 1.4 and 1.6, which have just been discussed. There is no reason why the skilled addressee would conclude that there were absolute dimensional limits: a filter can never be perfect – tiny particles will still pass through;
 - (b) [0013] of the Patent uses the word “may” and not “must”;
 - (c) Claims 3 and 4 (set out above) have dimensional limitations in them of “no more than 2µm” (Claim 3) and “less than or equal to 2nm” (Claim 4) – therefore, the skilled addressee would interpret those claims as being narrower than Claim 1; and
 - (d) [0012] of the Patent talks of “substantially” preventing the passage of solid materials.
76. I agree with the Claimant for the reasons it advanced. Applying a purposive construction to Claim 1, there is nothing that I can see which implies a specific pore size. Whilst a pore size is mentioned in

[0013] and also Claims 3 and 4, where it appears in [0013] it is optional (“may”) not required (“must”) and Claims 3 and 4 are subsidiary claims, which I accept in this case are to be interpreted more narrowly than Claim 1. What is important is that there is a filter, which substantially prevents the passage of solids, including clay fines.

Novelty

Novelty – the law

77. The parties agreed on the law on novelty: I was referred to the judgment of Sachs LJ in *General Tire & Rubber Co v Firestone Tyre & Rubber Co Limited* [1972] RPC 457 at 486:

“To anticipate the patentee’s claim the prior publication must contain clear and unmistakable directions to do what the patentee claims to have invented: *Flour Oxidizing Co Ltd v Carr & Co Ltd* (1908) 25 RPC 428 at 457, line 34, approved in *BTH Co Ltd v Metropolitan Vickers Electrical Co Ltd* (1928) 45 RPC 1 at 24, line 1). A signpost, however clear, upon the road to the patentee’s invention will not suffice. The prior inventor must be clearly shown to have planted his flag at the precise destination before the patentees.”

78. I was also reminded of Lord Hoffman’s speech in *H Lundbeck A/S v Generics (UK) Limited* [2008] EWCA Civ 311 at paragraph 9 that the prior art relied on must “disclose the claimed invention and (together with the CGK) enable the ordinary skilled person to perform it”. In this context, the word “disclose” means to disclose the subject matter which, if performed, would necessarily result in infringement of the patent: *Synthon BV v SmithKline Beecham plc* [2006] RPC 10 at paragraph 22, see also *Takeda UK Limited v F. Hoffman – La Roche AG* [2019] EWHC 1911 (Pat) at paragraphs 118 to 134 per Birss J.

Novelty over Hoare

79. I must first construe the teachings of Hoare, and then set out what the skilled addressee would derive from it.
80. As noted above, Hoare is titled “Improvements in or relating to pavements” and is directed to the same problem as the Patent. It was published on 9 February 1995, more than 15 years before the Patent’s application date. Hoare relates to pavements generally, but, as both experts agreed, also refers to railway pavements specifically. Pumping erosion is referred to in [0002] of Hoare – and [0003] of Hoare specifically mentions the problem arising in relation to railway pavements. The disadvantages of using sand to prevent pumping erosion are referred to in [0004] of Hoare (“expensive and time consuming”). Geotextiles are referred to as a potential solution to prevent pumping erosion in some circumstances. Paragraph [0006] of Hoare teaches “the use of a multi-layer structure at the interface between the pavement subbase/ballast and the subgrade, said multi-layer structure comprising upper and lower flexible sheet materials and an intermediate load-spreading layer”. The “multi-layer structure” is shown at Figures 1, 2 and 3 as follows, where Figure 1 is a plan view and Figures 2 and 3 are cross-sections:

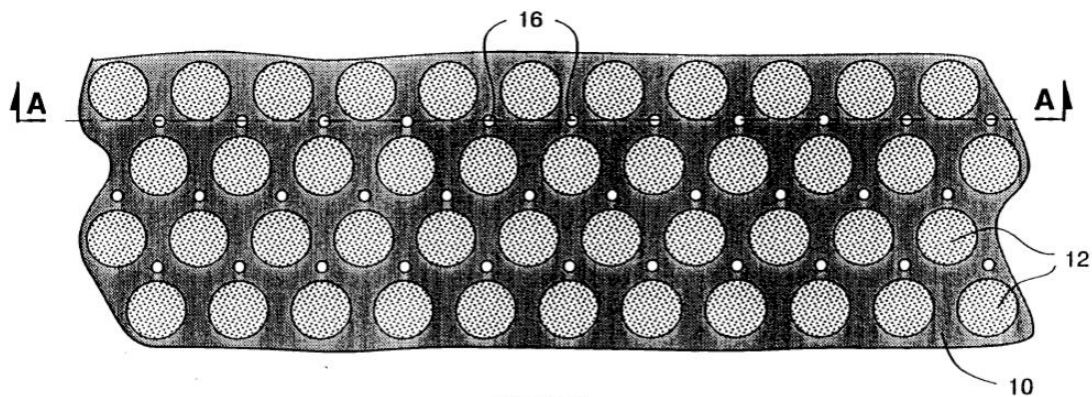


Figure 1.

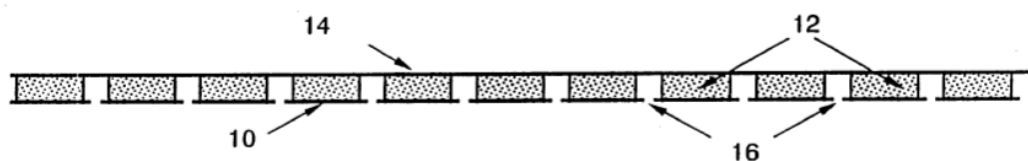


Figure 2.

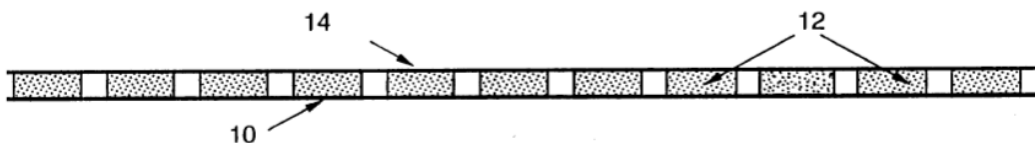


Figure 3.

81. In [0006] of Hoare, the intermediate load-spreading layer is further described as having gaps (16) – shown between the disks (12) in Figure 1 – so that liquid can pass through. These “disks” are described at [0010] as preferably having an area in the range of 20-500mm², more preferably 75-315mm² and most preferably 20-500mm², with a thickness of between 3mm and 5mm. Professor Ingold described them as about the size of a Pound coin.
82. The upper layer (14) is also described as water permeable. The lower layer (10) can be one of three possible types:
- (a) Type (a): “substantially water impermeable but provided with perforations or slits therethrough [(16)] at locations which open into the gaps between the load-spreading elements”;
 - (b) Type (b): “water vapour permeable but substantially impermeable to liquid water”;
 - (c) Type (c): “substantially impermeable to liquid water and water vapour”.
83. The Defendant’s novelty case relied only on a lower layer of type (b). I therefore need say nothing further about types (a) and (c). A type (b) lower layer is further described at [0017] of Hoare:

“In the case where the lower flexible sheet material is a type (b) material (ie water vapour permeable but substantially impermeable to liquid water), such material might be a composite sheet formed of a pair of outer water permeable textile layers with an intervening water vapour permeable barrier layer eg a barrier layer formed of an unsintered sheet of polytetrafluoroethylene which is expanded so as to produce a fine microstructure characterised by nodes interconnected by fibrils (see for example GB (in the patent, the Kind code is listed: GB-A-1355373).”

84. GB 1355373 is Gore. I accept for the purposes of this case the Defendant’s submission that the express cross-reference to Gore means that Gore is to be taken as part of the disclosure of Hoare. Gore is a patent relating to the well-known GORE-TEX material, already referred to above. It is expressly directed to the node-fibril PTFE sheets discussed in Hoare. It is also primarily directed to what it calls “porous materials”. Gore also makes clear that the materials it discusses are suitable for use as filter membranes.
85. Gore gives examples of materials in accordance with its invention, only one of which the Defendant submitted would be understood to satisfy the requirements of Hoare: example 10. Example 10 is impermeable at lower pressures (below 5PSI/35kPA) and permeable above 10PSI/70kPA. Example 10 is also expressly taught as being useful for filtration.
86. The Defendant submitted that the lower composite layer of Hoare option (b) discloses a three layer trackbed liner using as its central layer the material disclosed by example 10 of Gore – such a trackbed liner, the Defendant said, would fall within Claim 1 of the Patent.
87. The Claimant submitted that the reference to Gore in Hoare tells the skilled addressee *how* to make a lower layer of a type (b) material and what it may consist of – that is, it *might* be a 3-layer composite in which the inner layer provides the water impermeable/vapour permeable “barrier layer”. Hoare then describes the *process* by which such a barrier layer may be made, starting with an unsintered sheet of PTFE and expanding it to produce a fine microstructure of tiny holes. The Claimant submitted that the reference to Gore tells the skilled person that if she/he wants more details of the process described, she/he should refer to Gore. The skilled person who decides to use the expanded PTFE material would assess the requirements for the particular application and then source or have made to her/his specification a “barrier layer” according to that process which met those requirements. Hoare, the Claimant submitted, does not direct the reader to any particular example in Gore, nor does it promise or even suggest that any particular example in Gore might be used.
88. In my judgment, the Defendant’s lack of novelty case fails for the following reasons:
- (a) as the Claimant pointed out, the invention described in Hoare, even including the reference to Gore, does not read onto the structure described in the Patent: Hoare does not describe the use of a filter layer, nor does it reference a layer which is normally impermeable to water but allows the upwards passage of water under the load of a train. Hoare does not address these concepts at all;
 - (b) Hoare directs the skilled addressee to a choice of three lower layers – of which the Defendant relies on type (b). This is a 3-layer sandwich construction, but Hoare directs that the middle layer must be substantially impermeable to liquid water and Professor Ingold gave no clear answer as to why the skilled addressee would ignore this requirement, even taking into account example 10 from Gore. Even so, if the skilled addressee considering Hoare wanted a water permeable layer, Hoare would direct her/him to a type (a) material with large perforations or slits in it, on which the Defendant expressly did not rely.
89. In my judgment, Hoare (incorporating Gore) does not allow the skilled person, using the CGK, to perform the invention. It does not provide clear instructions to make something that would infringe the Patent. Nor does it disclose directions which would inevitably result in the invention being

performed. Rather, as Professor Ingold conceded, Hoare would not be seen as having a practical application for a commercial product. Hoare has not planted its flag at the precise destination of the Patent. Indeed, in my judgment, Hoare instructs something else.

90. The Defendant's case that the Patent lacks novelty over Hoare therefore fails.

Obviousness

Obviousness – the law

91. The law on obviousness was not in dispute – I was referred to the speech of Lord Hodge JSC in *Actavis Group PTC EHF and Ors v ICOS Corporation and Anor* [2019] UKSC 15 at paragraphs 52 to 73. The parties also agreed that I should adopt the structured approach to obviousness formulated by Jacob LJ in *Pozzoli SpA v BDMO SA* [2007] EWCA Civ 558 at paragraph 23:

“(1) (a) Identify the notional [skilled addressee]; (b) Identify the relevant common general knowledge of that person;

(2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it;

(3) Identify what, if any, differences exist between the matter cited as forming part of the “state of the art” and the inventive concept of the claim or the claim as construed;

(4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?”

92. As Lord Hodge made clear in *Actavis*, the fourth *Pozzoli* question is the statutory test – the first three tasks are means of disciplining the court's approach to the fourth question: see also *DSM NV's Patent* [2001] RPC 35 per Neuberger J (as he then was) at paragraph 55 and *Actavis UK Ltd v Novartis AG* [2010] EWCA Civ 82 per Jacob LJ at paragraph 21.

93. I was also reminded that hindsight must be avoided: per Oliver LJ in *Windsurfing International Inc v Tabur Marine (Great Britain) Limited* [1985] RPC 59. I was also reminded that *Non-Drip v Strangers* [1943] 60 RPC 135 and *British Westinghouse v Braulik* (1910) 27 RPC 209 remain good law: *Technip France SA's Patent* [2004] RPC 46.

94. The Defendant referred me to three sub-issues: obvious to try, long-felt want and “step-by-step” analysis.

Obvious to try

95. The Defendant relied on the judgment of Diplock LJ (as he then was) in *John Manville Corp's Patent* [1967] RPC 479 at 493:

“I have endeavoured to refrain from coining a definition of “obviousness” which counsel may be tempted to cite in subsequent cases relating to different types of claims. Patent law can too easily be bedevilled by linguistics, and the citation of a plethora of cases about other inventions of different kinds. The correctness of a decision upon an issue of obviousness does not depend upon whether or not the decider has paraphrased the words of the Act in some particular verbal formula. I doubt whether there is any verbal formula which is appropriate to all classes of claims. The superintending examiner used the expression “alerted to the

possibilities” of using polyacrylamides in improving the filterability of asbestos cement slurries. I find no fault with this phrase in the context of the claim in the appellants’ specification. The learned judge preferred the expression “see without difficulty that these newly-introduced polymers would be of advantage in his filtration step”. I think that “would be” puts it too high if it postulates prior certainty of success before actually testing the polymers in the filtration process; it is enough that the person versed in the art would assess the likelihood of success as sufficient to warrant actual trial.”

96. I accept that certainty of success is not required before commencing the test – but that there must be, in all the circumstances, a reasonable expectation of success. See also *Actavis Group PTC HFF and Anor v Eli Lilly and Company* [2015] EWHC 3294 (Pat) per Henry Carr J at paragraphs 102 to 107.

Long-felt want

97. Counsel for the Defendant submitted that long-felt want is often pleaded but rarely succeeds. Long-felt want refers to where the inventor has solved a long-recognised problem by means which others could have used but did not: this supports the existence of inventive step: *Minnesota Mining and Manufacturing Co v Rennicks (UK) Limited* [1992] RPC 331 at 354. See also Jacob LJ in *Technip France SA’s Patent* [2004] RPC 46 at paragraph 122:

“All the ‘bits and pieces’ of the invention were known separately for many years. The question ‘why was it not done before’ is always a powerful consideration when considering obviousness, particularly when all the components of a combination have been long and widely known. Sometimes there is a good answer (eg, no demand, not worth the expense, prior art only recent).”

98. Counsel for the Defendant also referred me to the Court of Appeal’s judgment in *Schlumberger Holdings Limited v Electromagnetic Geoservices AS* [2010] EWCA Civ 819, approving Laddie J’s “non-exhaustive summary” of the relevant factors in *Haberman v Jackel* [1999] FSR 683. I have kept Jacob LJ’s comments from both *Technip* and *Schlumberger* in mind in reaching my conclusions on obviousness. As will be apparent from the facts I have set out above, this is not a case where the three possible “good answers” listed in *Technip* might apply. Both parties accepted that there was a clear demand for a product to prevent pumping erosion, and that the demand had been apparent for many years. Further, given the difficulties and costs of laying a layer of sand, it was clearly worth the expense to find a solution. Finally, the prior art relied on by the Defendant is not recent – Hoare is from 1995, Gore from 1974, and Jay from 2001. But Counsel for the Defendant was also right in his submissions that the answers to many of Laddie J’s factors can only be surmised from the evidence in this case. I do not, however, see long-felt want as a stand-alone answer to a claim of obviousness – I must still apply the statutory test and guidance set out in the case law. Unlike *Haberman v Jackel*, it was not put to me that this was a case of “apparent technical obviousness” that turns into one of non-obviousness by the application of a doctrine of long-felt want. Counsel for the Claimant simply asked me to keep it in mind in my assessment of obviousness.

Step-by-step

99. Counsel for the Defendant noted in closing that he did not wish to be accused of a step-by-step analysis to obviousness: see, for example, *Technograph Printed Circuits Ltd v Mills & Rockley (Electronics) Limited* [1972] RPC 346. I did not take Counsel for the Claimant to have made that claim, and so say no more about it.

Obviousness over Hoare

100. I have set out above the parties' agreed description of the skilled addressee and the CGK (*Pozzoli* step 1). Step 2 is to identify the inventive concept. The Defendant suggested the following inventive concept:
- “(a) A trackbed liner comprising: an upper support layer; a lower support layer with a filtration layer sandwiched in between;
 - (b) that filtration layer is impermeable to liquid water in the absence of the load of a vehicle acting on the trackbed;
 - (c) that filtration layer is permeable to water under the load of a vehicle acting on the trackbed;
 - (d) that filtration layer has pores which restrict the passage of solid materials sufficiently to prevent pumping erosion.”
101. The Defendant submitted that Hoare's teaching makes clear that a membrane with the characteristics of example 10 of Gore falls within the invention – that membrane is taught as being permeable above a certain pressure. The choice of such a membrane lies within the CGK of the skilled addressee – and, the Defendant submitted, is therefore an obvious workshop-type modification. Further, the Defendant submitted that the skilled person looks at Hoare with the pumping erosion problem in mind. Gore proposes a filter. It would therefore be obvious to choose a material of the type discussed by Gore, adapted if necessary to the particular requirements of a trackbed.
102. To the contrary, Mr Sangster maintained under cross-examination that Hoare required a membrane impermeable to water. This is what option (b) is about – as options (a) and (c), not relied on by the Defendant, provide for, in the case of (a), little more than a “crude filter” (as the Defendant put it) but something rather more like a plastic barrier with holes or slits in it and, in the case of (c), a wholly impermeable layer. I agree with that evidence of Mr Sangster's. In my judgment, the steps that the skilled addressee would need to take, in the absence of knowledge of the Patent, to bridge the difference between the inventive concept in Claim 1 of the Patent and Hoare (together with Gore) are too significant, because:
- (a) the skilled addressee would need to reject the teaching in Hoare that the liner should be substantially impermeable, and instead choose a layer which is permeable under the load of a train;
 - (b) the skilled addressee would need to use a liner capable of filtering clay fines, contrary to the teaching of Hoare; and
 - (c) the skilled addressee would need to select a material with pore sizes which make it impermeable to liquid water in the absence of a load, but which permits the upward passage of water under the load of a train. Gore does not provide the link – it describes a variety of materials which would not assist. Even example 10 references a material which becomes liquid permeable at about 69kPa, but Professor Ingold's evidence was that the pressure applied by a train in the UK would be between 140kPa and 280kPa. The skilled addressee following the instructions of Hoare would therefore not select a material according to Gore example 10.
103. In my judgment, a skilled addressee of the nature agreed between the parties, equipped with the CGK agreed between the parties, would not consider it obvious to take these steps. The Patent is not obvious over Hoare/Gore. Hoare addresses the known problem of pumping erosion, but proposes a very different solution.

104. Having found that the Patent is not obvious over Hoare combined with Gore, it necessarily follows that the Patent is also not obvious over Hoare alone.

Obviousness over Jay

105. As set out above, Jay is titled “Rail support structures and geosynthetics” and was published on 6 June 2001, ten years before the Patent. It is referred to at [0007] of the Patent. Jay identifies the problem of pumping erosion, and the known solution provided by geotextiles. It sets out the disadvantages of using a permeable geotextile – rainwater can pass downwards through it into the subgrade and clay fines can pass upwards increasing the risk of pumping erosion. Jay also describes the known use of an impermeable geomembrane sandwiched between two layers of sand. A key element of the different solutions proposed by Jay is:

“(b) an impermeable characteristic to prevent water from moving upwardly or downwardly through the geocomposite (eg to prevent rain water from passing into the underlying subgrade, and to prevent hydraulic pumping of underlying water into the ballast);”

106. Therefore, in short, and as accepted by both parties, Jay required an impermeable membrane. Consistent with the Ayers’ Paper, and as accepted by both experts, Jay did not solve the problem of pumping erosion. Mr Sangster was aware of a product made in accordance with Jay.

107. The Defendant’s case was put as follows:

- (a) a skilled addressee reading Jay at the priority date would know that Jay would not prevent pumping erosion – slurry would pass laterally through the lower support layer because it could not pass upwards through the impermeable membrane;
- (b) it would be obvious to the skilled addressee to consider whether the loss of water laterally could be prevented;
- (c) Jay teaches that a permeable layer could be used to remove water vertically: Jay does not teach a filtration layer, but rather recognises that the pores in the permeable layer would allow clay fines to pass;
- (d) the CGK included a basic knowledge of the construction and operation of geotextiles, and that geotextiles could be modified to prevent soil particles being washed out of the soil and/or to control water flow under certain pressures; and
- (e) it therefore would have been obvious to consider whether the impermeable membrane could be made sufficiently permeable to allow water to be expelled from the subgrade to discharge vertically upwards but without carrying subgrade soil fines (meaning the obvious pore size would be less than 2µm).

108. The Defendant submitted that Mr Sangster agreed with all these propositions, but accepted that Mr Sangster also said that a skilled addressee would not take the steps it suggested because she/he would no longer be following the teaching in Jay. But the Defendant said that the skilled addressee would understand that Jay did not prevent pumping erosion, and so there was a clear motivation to modify, and, in the Defendant’s submission, an obvious way of modifying open to the skilled addressee. Professor Ingold pointed out that all the geotextiles discussed in Jay had pores which were too large – and this drove Jay’s motivation to use a geomembrane. This, he said, would be the next obvious step to take.

109. On behalf of the Claimant, Mr Sangster’s evidence was, clear:

“Without knowledge of the Patent, the skilled person would need to take the following steps to bridge the differences between the inventive concept of claim 1 of the Patent and the liner described in [Jay]:

- i. Ignore the requirement within [Jay] that the liner remains impermeable when a train passes, but instead use a liner that allows upwards passage of water, against the warnings set out in [Jay].
- ii. Utilise a filtration layer capable of filtering solids as water passes upwardly from the subgrade, unlike the geomembrane described in [Jay].”

110. He did not resile from that position in cross-examination.
111. Professor Ingold accepted that the skilled addressee would appreciate that Jay would not prevent pumping erosion, with water flowing laterally carrying clay fines out of the system. But his view was that the skilled addressee would therefore strive to modify Jay, and, particularly, “to modify the impermeable membrane to make it sufficiently permeable to allow water expelled from the subgrade to discharge vertically upwards but without carrying subgrade soil fines”.
112. I prefer Mr Sangster’s position. Jay is all about using an impermeable layer, which Jay accepts will not avoid pumping erosion. I accept that the skilled addressee, who wishes to avoid pumping erosion, will look for alternatives. Permeable membranes were known. But it is by no means clear to me that a skilled addressee equipped with the CGK would:
 - (a) replace an impermeable membrane with a permeable one;
 - (b) introduce a filtering element when none is hinted at in Jay; and
 - (c) choose a geomembrane that operated under the load of a train – that is, it would allow water to pass up through it (whilst being filtered) only under the pressure of the load of a train, and not under the pressure of the tracks and ballast in the absence of a train.
113. In my judgment, the Patent is not obvious over Jay.

Insufficiency

114. The Defendant’s insufficiency case was put on three bases:
 - (a) Uncertainty (sometimes called ambiguity);
 - (b) Classical insufficiency/lack of enablement; and
 - (c) Lack of plausibility.
115. The Defendant submitted that these assertions are underpinned by the general principle that the extent of the monopoly granted by the Patent should correspond to and be justified by the actual technical contribution to the art, citing *Warner-Lambert v Generics* [2018] UKSC 56 at 17 per Lord Sumption JSC. The Defendant further submitted that:
 - (a) the Patent teaches an invention which the skilled person would not believe to work and/or the Patent teaches an invention which, if its teaching is followed, does not in fact work;
 - (b) the Patent has no data which assist the skilled person in (i) believing or (ii) understanding how the invention is supposed to work; and

- (c) if contrary to the skilled person's expectation, the invention does work in some circumstances, the Patent is silent on how to identify what those situations are.

Insufficiency - the law

116. The law on insufficiency was not in dispute between the parties, so I set it out only briefly.
117. As noted by Floyd LJ in *Anan Kasei Co Ltd v Neo Chemicals and Oxides Limited* [2019] EWCA Civ 1646, insufficiency has been found to arise in a number of distinct ways, although there is only one statutory question provided for in section 72(1)(c) of the Patents Act 1977:

“the specification of the patent does not disclose the invention clearly enough and completely enough for it to be performed by a [skilled addressee]”.

118. In relation to uncertainty, I was referred to paragraphs 23 to 27 (per Floyd LJ) and paragraphs 98 and 104 (per Lewison LJ) of *Anan Kasei*. Paragraph 25 refers with approval to the comments of Jacob J (as he then was) in *Milliken*, referred to above. In that case, the judge held that “water impermeable in normal use” was not uncertain: I accept that I am not bound by the findings of fact in that case.
119. “Classical insufficiency” will arise where the patent does not give sufficient directions to enable a product to be made without undue burden. Kitchin J (as he then was) summarised the law in *Eli Lilly and Company v Human Genome Sciences Inc* [2008] EWHC 1903 (Pat) at paragraph 239:

“The specification must disclose the invention clearly and completely enough for it to be performed by a person skilled in the art. The key elements of this requirement which bear on the present case are these:

- i) the first step is to identify the invention and that is to be done by reading and construing the claims;
- ii) in the case of a product claim that means making or otherwise obtaining the product;
- iii) in the case of a process claim, it means working the process;
- iv) sufficiency of the disclosure must be assessed on the basis of the specification as a whole including the description and the claims;
- v) the disclosure is aimed at the skilled person who may use his common general knowledge to supplement the information contained in the specification;
- vi) the specification must be sufficient to allow the invention to be performed over the whole scope of the claim;
- vii) the specification must be sufficient to allow the invention to be so performed without undue burden.”

120. I was also referred to the judgment of Kitchin LJ (as he then was) in *Regeneron Pharmaceuticals Inc v Kymab Ltd* [2018] EWCA Civ 671 at paragraphs 243 to 245.
121. In relation to plausibility, I was referred to the judgment of Lord Sumption JSC in *Warner-Lambert Co LLC v Generics (UK) Limited Ha Mylan and Anor* [2018] UKSC 56. That case concerned second medical use claims. Lord Sumption explained that the concept of plausibility originated as a response to over-broad claims. Lord Sumption said at paragraph 19:

“Section 14 of the Patents Act ... assume[s] that an invention will be sufficiently disclosed if the specification enables it to be “performed”. In the case of a patent for a new product or process, that assumption is almost always correct. The skilled person will discover that it works by replicating it in accordance with the specification. But the assumption is not correct in the case of a second use patent.”

122. Lord Sumption went on to say at paragraph 20:

“The main problem about this result [that is, that the knowledge which made the identification of the new purpose inventive need not be disclosed at all] is that it would enable a patent to be obtained on a wholly speculative basis. Without some disclosure of how or why the known product can be expected to work in the new application, it would be possible to patent the manufacture of known compounds for the purpose of treating every conceivably relevant condition without having invented anything at all, in the hope that trial and error might in due course show that the product was efficacious in treating at least some of them.”

Uncertainty

123. The Defendant’s uncertainty attack alleged that the Patent is insufficient because it lacks clarity and/or is ambiguous. In particular, it was said that it is not possible for the skilled addressee to determine, without undue effort:

- (a) whether a trackbed liner made in accordance with the teaching of the Patent has a filtration layer that permits passage of liquid water upwardly therethrough;
- (b) whether a trackbed liner falls within Claim 1 where impermeability is not limited to the case in which no water at all passes in the absence of the load of a vehicle acting on the track bed; and
- (c) whether a trackbed liner falls within Claim 1 where the filtration layer in use and under the load of a vehicle acting on the trackbed has less than an infinite (or quasi infinite) permeability to liquid water, because the skilled addressee could not determine without undue effort the rate at which liquid water should be permitted to pass upwardly through the filtration layer in order to satisfy the remaining requirements of the claim.

124. These grounds of uncertainty all relate to the correct construction of integers 1.4 and 1.6 of the Patent, which I have discussed above.

125. The Claimant referred me again to the judgment of Jacob J (as he then was) in *Milliken* where it was alleged that “impermeable in normal use” was uncertain (at page 9):

“It must be borne in mind that these mats are essentially of an industrial character. They are for places where many people walk and for floors which have to stand up to massive use. The skilled man is not concerned with tiny drops of water; likewise he would not be concerned in manufacture if there were minor imperfections with the spikes of the rollers used to make these perforations. For practical purposes there is no difference between a few drops getting through and nothing getting through. I am reinforced in this belief by the fact that there are no reported complaints by anybody at any time of any of the mats concerned, the plaintiff’s or either defendant’s. I do not think that the claim is ambiguous or unenforceable: the concept of normal use, although fuzzy, is not one beyond the skilled man.

Moreover, I cannot think of any reason why the skilled man would have wanted to exclude the case of mats which leaked a very small amount.”

126. As noted above, I am not bound by the findings of fact made by Jacob J in that case, but they do reinforce the conclusions to which I have come. In my judgment, the skilled addressee is able to ascertain the boundary of the invention claimed in the Patent. In doing so, as I have noted above, the skilled addressee will be aware of the context – that these are industrial barriers to be placed between rough aggregate and clay subgrade. These are conditions which are very rugged, and the skilled addressee will interpret “normally impermeable” accordingly. The skilled addressee will simply not care whether the product works perfectly – ie, no measurable water passes downwards through the geomembrane and no measurable clay fines pass upwards through the geomembrane. The skilled addressee is concerned to overcome the well-known problem of pumping erosion – she/he will not be interested in detailed or accurate measurements of tiny amounts of either water or clay fines.
127. In my judgment, the boundaries of Claim 1 are not uncertain. The skilled addressee knows what test to apply to determine infringement.

Classical insufficiency

128. The law does not require a patentee to explain the physical theory of the invention. Once a product is made according to the patent, it can be tested without undue difficulty to see whether it works.
129. The Defendant’s case was that the Patent makes generalised claims to trackbed liners with certain permeability and filtration properties, but has no generalised teaching of how to make such liners. Particularly, the Defendant submitted that the Patent has no teaching as to how to make a trackbed liner which does not have substantially lateral flow when under the load of a train. The Defendant relied first on Professor Ingold’s theory that the invention simply doesn’t work. In the alternative, the Defendant argued that, according to Mr Sangster, the invention may work in a very limited set of circumstances – when the lower support layer is clogged or blocked. It follows, the Defendant submitted, that in order to work out how to make a trackbed liner work in accordance with the Patent, the skilled addressee would need to:
- (a) recognise that there was a problem;
 - (b) realise that the problem could be solved in use;
 - (c) determine what subgrade conditions were required; and
 - (d) determine how long the liner had to be laid on the particular subgrade (taking into account any local variations in conditions).
130. The Defendant submitted that the skilled addressee would not be able to work out under what conditions the invention would work – and cannot be expected to wait eight years in order to make that determination.
131. The Claimant’s case was that the Patent explains, and the skilled reader would understand, how the product described works at the following level of generality:
- “As a result of the rapid, heavy and cyclical load of trains passing overhead water from below is forced upwardly against and through the filter layer, clay particles (or larger particles) which are carried in the water are filtered and left behind.”
132. The Claimant submitted that the precise mechanism of the flow of slurry does not matter, because a product made in this way clearly works – examples include Hydrotex and Tracktex. The tests on Hydrotex, including for example the University of Birmingham test, were not unduly burdensome – indeed, a test similar to the University of Birmingham test is the sort likely to be desirable to satisfy organisations responsible for railway construction.

133. I have rejected Professor Ingold's theory that the Patent does not work because water will flow laterally sideways rather than be forced upwardly through the filtration membrane. I have also found that clogging/blocking was one possible explanation put forward by Mr Sangster for what, both parties conceded, was a very complex interplay of forces beneath the geotextile. I accept the Claimant's submission that I do not need to establish exactly how a product made to the Patent works in order to find that it is sufficient. I have found that a product made to the Patent (Hydrotex) does work and can be tested. The classical insufficiency case therefore fails.

Lack of plausibility

134. The Defendant's case was that the Patent contains no information in the specification which renders plausible the making of a trackbed liner as required by the claims. In particular, the Defendant submitted that:
- (a) the skilled addressee would consider that there was no reasonable prospect that following the teaching of the Patent would create a trackbed liner where "the filtration layer permits the passage of liquid water upwardly therethrough". The skilled addressee would believe that a trackbed liner made in accordance with the Patent would not permit the upward passage of water, with the water flowing laterally instead;
 - (b) there is no data in the Patent to confirm the proposition that the filtration layer permits the passage of liquid water upwardly;
 - (c) clay fines would be pumped laterally through the support layer;
 - (d) the teaching of Jay is consistent with the teaching of the Patent being incorrect; and
 - (e) therefore, the proposition in the Patent is no more than a bare assertion: there are no data to rescue the skilled addressee from her/his initial view that the Patent would not work.
135. Thus, the Defendant submitted by reference to the steps in *Warner-Lambert* that:
- (a) the invention is not plausible because the skilled addressee would believe it did not work;
 - (b) the invention is no more than a bare assertion as it is not rendered plausible by a scientific theory set out in the Patent; and
 - (c) there are no data in the Patent which prove the theory.
136. The Claimant's case was that the Patent could only be implausible if there were an incontrovertible theory that the Patent cannot work. As set out above, I have rejected Professor Ingold's theory that the Patent cannot work. Further, Mr Sangster's evidence was that Claim 1 of the Patent was entirely plausible – he did not consider that the skilled addressee would have any particular difficulty working out how to make a trackbed liner according to the claims of the Patent, or determining whether they had made such a trackbed liner.
137. As Lord Sumption said in *Warner-Lambert*, a patent for a new product or process will "almost always" be plausible. I therefore reject the Defendant's submission that the Patent is invalid for lack of plausibility.

Infringement

The law on infringement

138. The parties accepted that the law on infringement is as set out by the Court of Appeal in *Icescape Ltd v Ice-World International BV* [2018] EWCA Civ 219. In short, the scope of protection of the Patent

is to be determined in two stages: (1) by reference to the meaning of the claims as purposively construed and (2) by reference to the issue of equivalence.

The Defendant's case on non-equivalence infringement

139. The Defendant submitted that Hydrotex does not infringe the Patent for three reasons. The first two issues were run in the alternative, whilst the third was run as a free standing point:
- (a) Hydrotex does not fall within integer 1.6 and 1.6.1 of claim 1: “in use and under load of a vehicle acting on the trackbed, the filtration layer permits passage of liquid water upwardly therethrough” – instead, the Defendant submitted that water is never permitted through the filtration layer, but instead passes laterally out through the support layer (Professor Ingold’s theory);
 - (b) If water is permitted to pass vertically through the filtration layer, then the Defendant submitted that Hydrotex does not infringe because it does not satisfy integer 1.4 of claim 1: “normally impermeable to water, that is in the absence of the load of a vehicle acting on the trackbed”. This was put on two bases, depending on whether I accepted the Defendant’s or the Claimant’s construction of “normally impermeable to water”. On the basis of the Defendant’s construction that the membrane must be impermeable to water when exposed to water at a pressure equivalent to the ballast, sleepers and track (that is, absent the load of a train), the Defendant argued that the Patent specifies the relevant pressure – approximately 2.9kN/m². Neither party sought to argue with the figure in the Patent. The Defendant submitted that the experiments show that Hydrotex is permeable to water at a water pressure of 2.7kN/m² – and thus does not fall within integer 1.4 of claim 1. In the alternative, on the basis of the Claimant’s construction, that is, that impermeability is satisfied if water will not pass through Hydrotex at a 50mm head of water, the Defendant submitted that this does not account for the “bathtub” effect to which I have referred and, further, that the data relied on were not sufficiently reliable to conclude that water will not pass through Hydrotex when just under the load of a track/ballast; and
 - (c) Third, the Defendant submitted that a filtration layer in accordance with Claim 1 requires a pore size of no more than 2µm, and, as the PPD makes clear, Hydrotex uses a filtration layer with a mean pore size of 4µm and a range of 0.06 – 7µm, giving it a pore structure too large to satisfy Claim 1.

The Claimant's case on non-equivalence infringement

140. The Claimant’s case was that infringement turned on integers 1.4 and 1.6, submitting that:
- (a) Hydrotex satisfies integer 1.6 (upward movement of water to filter clay particles); and
 - (b) in relation to integer 1.4, the WEP of Hydrotex is greater than a 50mm head of water (approximately 0.5 kPa) and probably less than a 280mm head of water (about 2.7 kPa). A head of water greater than 50mm was accepted by both experts to be unlikely, and therefore not “normal” (it would be a flood, and subject to bathtub regions, discussed below). Therefore, the Claimant submitted that integer 1.4 is also satisfied.

Conclusions on non-equivalence infringement

141. I have set out above my findings on the basis of the evidence before me. I have not accepted Professor Ingold’s theory that water carrying clay fines will not pass through the filter but will instead pass laterally through the lower support layer to the drains at the side of the track. I have also rejected the Defendant’s submission that the Patent requires a pore size of no more than 2µm.

142. The issue that remains to be decided on the basis of the parties' submissions, therefore, is whether Hydrotex is "normally impermeable to water, that is in the absence of the load of a vehicle acting on the trackbed". I have rejected the Defendant's case that permeability is to be assessed in accordance with the pressure applied by the ballast, sleepers and track, because water from above the geotextile will not be at that pressure – it will simply pass through the ballast, and run off to the side into the drains. I have accepted the evidence of both experts that a stand of more than 50mm of water is unlikely, and therefore not "normal", subject to "bathtubs". I need therefore discuss what Professor Ingold described as "bathtubs" to which I have already briefly referred.
143. Geofabrics are cambered on a slope of approximately 1m in 40ms, so that, in the absence of any irregularity, rain water falling onto the geofabric prior to the laying of the ballast, sleepers and track would run to the side into the drains. But in practice, there are irregularities. The geofabric is laid on subgrade that may not slope perfectly, and the application of ballast creates dips in the geofabric. These dips can hold rainwater (among other liquids) at depths exceeding 50mm: Professor Ingold described these as "bathtubs".
144. It was Mr Sangster's evidence that, whilst under a bathtub head of water of 50mm, Hydrotex would be impermeable, it would not be impermeable with a head of water greater than 50mm. The Defendant criticised the experiments, but both parties accepted that water will not pass through Hydrotex at a pressure corresponding to a 50mm head of water, but will pass through Hydrotex at a pressure corresponding to a 280mm head of water.
145. I do not need to resolve at exactly what head of water Hydrotex will be permeable, because the Patent claims a filtration layer which is "normally" impermeable to water.
146. Mr Sangster was aware of "bathtubs", but considered these to be for only "relatively short periods", and not "normal". A depth of more than 50mm would be "extremely unlikely to occur over a significant area of trackbed because the open, granular nature of the ballast cannot contain such a depth of water, it would simply drain away laterally unless there were a depression in the surface of the subgrade in which water could collect". Professor Ingold's evidence was that the bathtub effect would have "a localised effect and is unlikely to affect the overall head caused by rain events."
147. In my judgment, Hydrotex falls within integer 1.4 of the Patent. Hydrotex was accepted by the Defendant to be impermeable to water under a head of water of 50mm, and I accept the evidence of Mr Sangster that a head greater than 50mm would not be usual, and Professor Ingold's evidence that such effect would be localised. In short, whilst bathtubs may lead to water passing downwards through the geotextile, the effect of this would be localised. Despite bathtubs, Hydrotex remains "normally impermeable" within integer 1.4 of the Patent.
148. I therefore find that Hydrotex infringes the Patent.

Equivalence infringement

149. As I have found that Hydrotex infringes the Patent, I briefly set out my conclusions below if I am wrong and the Patent falls outside integer 1.4 because of "bathtubs".
150. Counsel for the Defendant submitted that the Claimant's equivalence arguments could not be made because they had not been pleaded and there was no evidence on which they could be based. I disagree. This was not a case where there was no "normal" infringement and so the claimant was forced to rely on equivalence as its primary argument. Rather, equivalence was relied on in the alternative. As "infringement" had been pleaded, it covered both "normal" and "equivalence" infringement. In relation to evidence, this was not, in my judgment, a case on all fours with the decision of Henry Carr J in *Illumina Inc and Ors v Premaitha Health plc and Ors* [2017] EWHC 2930 (Pat), and particularly the judge's comments at paragraph 255. There was before me, in my judgment, sufficient evidence to make findings on the basis on which the equivalence case was put.

151. I was referred to *Actavis UK Ltd v Eli Lilly and Co* [2017] UKSC 48 and the discussion of that case by Lord Kitchin JSC in *Icescape*. At paragraph 66-67 of *Icescape* Lord Kitchin said:

“66. The whole approach to interpretation and scope of protection therefore involves the following steps, considered through the eyes of the notional addressee:

- (i) Does the variant infringe any of the claims as a matter of normal interpretation?
- (ii) If not, does the variant nevertheless infringe because it varies from the invention in a way or ways which is or are immaterial? This is to be determined by asking these three questions:
 - a) Notwithstanding that it is not within the literal (that is to say, I interpolate, normal) meaning of the relevant claim(s) of the patent, does the variant achieve substantially the same result in substantially the same way as the invention, i.e. the inventive concept revealed by the patent?;
 - b) Would it be obvious to the person skilled in the art, reading the patent at the priority date, but knowing that the variant achieves substantially the same result as the invention, that it does so in substantially the same way as the invention?
 - c) Would such a reader of the patent have concluded that the patentee nonetheless intended that strict compliance with the literal meaning of the relevant claim(s) of the patent was an essential requirement of the invention?

67. Of course, in order to establish infringement in a case where there is no infringement as a matter of normal interpretation, a patentee would have to establish that the answer to questions (a) and (b) above is "yes" and that the answer to question (c) is "no".”

152. It is clear that the normal interpretation referred to in issue (i) involved purposive construction.

153. I have set out the inventive concept of the Patent above, that is, that rainwater will not pass down from above, but under the load of a train water will pass upwardly from below and clay particles will be filtered (*Icescape* question (ii)(a)). I would find that Hydrotex achieves substantially the same result in substantially the same way because, even if “bathtubs” are “normal”, the impact will be, as Professor Ingold stated, localised (*Icescape* question (ii)(b)). In my judgment, *Icescape* question (ii)(c) should also be answered in the negative – no reason has been put before me why the reader of the patent would conclude that strict compliance with the literal meaning of the claim was an essential requirement of the invention: indeed, to the contrary. The skilled addressee, in seeking to solve the problem of pumping erosion, will be unworried by some downwards permeability in “localised” “bathtubs”.

Conclusions

154. The Patent is not anticipated by Hoare (including Gore). The Patent is not obvious over Hoare (including Gore) or over Jay. The Patent is not insufficient. Hydrotex infringes the Patent.
