Patents Act 1977 **Opinion Number** **29/14**

OPINION UNDER SECTION 74A

Patent	GB 2499172 B
Proprietor(s)	Hydra Systems AS
Exclusive Licensee	
Requester	Archer Oil Tools AS
Observer(s)	Hydra Systems AS
Date Opinion issued	16 March 2015

Request

1. The comptroller has received a request from BeckGreener on behalf of Archer Oil Tools to issue an opinion on whether GB 2499172 B ("the Patent") is novel and inventive in light of a number of prior art documents. The proprietor of the Patent is Hydra Systems AS and the Patent is derived from international application WO-A-2012/096580.

2. The following evidence was supplied in the request:

Extract from a book entitled "Well Cementing" edited by Erik B Nelson and Dominique, second edition published 2006 by Schlumberger (hereafter identified as Nelson)

US-A-4372384 (Kinney)
GB-A-2414492 (Mackenzie)
US-A-4040482 (Vann)

Allowance of the request

3. The observer has argued that an opinion should not be issued as the prior art being relied on by the requester has already been sufficiently considered in proceedings before the IPO and EPO.

4. Rule 94.1(b) states that "The comptroller shall not issue an opinion if...the question upon which the opinion is sought appears to him to have been sufficiently considered in any relevant proceedings".

5. In the observations in reply the requester references Opinions 21/07 and 26/07 to argue that GB 2414492 (MacKenzie) which was cited as background art in the International Search Report on the EP equivalent before the EPO should be considered in this Opinion. I accept that this was the case in those Opinions however in decision BLO/370/07 the hearing officer stated that "It is an intrinsic part of the substantive examination process to assess the novelty and obviousness of the claims, as properly construed, in the light of the prior art. In this context, "prior art" means documents cited in the search report (at least under category "X" or "Y", which indicate possible relevance to novelty or inventive step) as well as material which has come to the examiner's attention in some other way. I think it reasonable to suppose in general that the examiner will have done his or her job properly in the absence of indication to the contrary, and I see no reason why this assumption should not apply even if the examiner has decided not to raise objection on the basis of any of the citations at substantive examination."

6. I also note there is a "Written Opinion of the International Searching Authority" available for WO-A-2012/096580 which specifically discusses the inventiveness of the original claims in light of Mackenzie and other documents.

7. In light of the finding by the abovementioned hearing officer and the "Written Opinion of the International Searching Authority", which would have been assessed by the IPO examiner during the normal course of examination, I agree with the observer that GB 2414492 (MacKenzie) has been previously considered by the EPO examiner and the IPO examiner prior to grant of the Patent and I will not specifically reconsider it in this Opinion with regard to novelty or a standalone inventive step objection.

8. MacKenzie has not however been considered in combination with Nelson or the other documents and as I will need to consider such a combination it will inevitably mean I will have to express an opinion on what MacKenzie actually discloses.

9. The observer further argues that prior art Nelson and Kinney have also been considered by the EPO examiner as they were filed together with third party observations and an examination report was issued by the examiner on 30.10.14.

10. The question is therefore have Nelson and Kinney been sufficiently considered? I note that in proceedings before the IPO, shortly after the third party observations were filed, the applicant made narrowing amendments before any examination report was issued by the examiner. The examination report referred to by the observer was therefore based on an amended claim 1. I have read the examination report and it contains little detail and seems to be mostly a request that the further arguments supplied by the third party are addressed by the applicant. It is therefore my opinion that although Nelson and Kinney have been put before the

EPO examiner they have not been sufficiently considered at this time, particularly against the non-amended claim 1. I will therefore consider Nelson and Kinney.

11. One further document US 4040482 (Vann) has been submitted for the first time in this Opinion request and I will also consider this document.

12. In the observations, the observer introduced two additional pieces of evidence, namely page 547 of Nelson which was not submitted by the requester, a copy of a case study of the Hydrawash system, published by Halliburton in 2013 and "Offshore Permanent Well Abandonment" Oilfied Review, Spring 2012; 24, no 1, 42-50, published by Schlumberger. The requester has had an opportunity to consider these documents, and has discussed them in the observations in reply so I will also consider them.

Observations

13. Observations were received from Lucas and Co on the 19th January 2015. As indicated above, the observations questioned whether it was appropriate to offer an Opinion. They also refuted the suggestion the Patent lacked novelty in light of the supplied prior art and discussed in detail definitions of various terms being relied on by the requester.

Observations in reply

14. Observations in reply were filed on 2nd February 2015 and reiterated the arguments that all the supplied evidence should be considered and that the claims lack novelty and/or inventiveness. Further comments were made on the scope and interpretation of the claims.

The Patent

15. The Patent relates to combined cleaning of an annulus in a well and subsequent plugging of a longitudinal section. Statutory regulations stipulate that during well abandonment, for example, casings must be pressure isolated outside and inside the casing and the Patent attempts to address this requirement.

Claim 1 of the Patent reads:

> Claim 1: A method for combined cleaning of an annulus (10) in a well (2) across a longitudinal section (L1) of the well (2), and subsequent plugging of the longitudinal section (L1), said annulus (10) being located outside a casing (8) in the well (2), wherein the method, for such combined cleaning and plugging, comprises the following steps:

(A) conducting a perforation tool (18; 18') into the casing (8) to said longitudinal

section (L1) of the well (2);

(B) by means of the perforation tool (18; 18'), forming holes (22) in the casing (8) along the longitudinal section (Li), characterized in that the method also comprises the following combination of steps:

(C) by means of a washing tool (24; 24') attached to a lower portion of a flow-through tubular work string (16) and conducted into the casing (8) to the longitudinal section (L1), pumping a washing fluid (26) down through the tubular work string (16) and out into the casing (8) via the washing tool (24; 24');

(D) by means of a directional means associated with the washing tool (24; 24'), conducting the washing fluid (26) radially outward into the annulus (10) via at least one hole (22) formed at a first location within the longitudinal section (L1), after which the washing fluid (26) will flow via the annulus (10) and onward into the casing (8) via at least one hole (22) formed in at least one second location within the longitudinal section (L1) ;

(E) pumping a fluidized plugging material (50) down through the tubular work string (16) and out into the casing (8) at the longitudinal section (L1); and

(F) placing the fluidized plugging material (50) in the casing (8), hence also in the annulus (10) via said holes (22) in the casing (8), along at least said longitudinal section (L1) of the well (2), whereby both the casing (8) and said annulus (10) is plugged along at least said longitudinal section (L1) of the well (2).

16. The following drawings help to illustrate what is claimed.

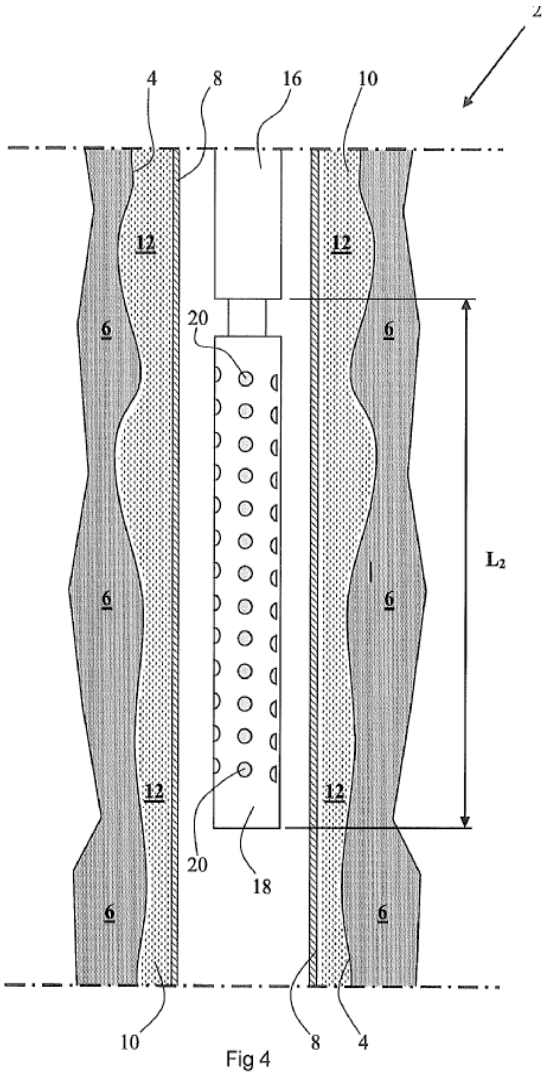

Fig 4

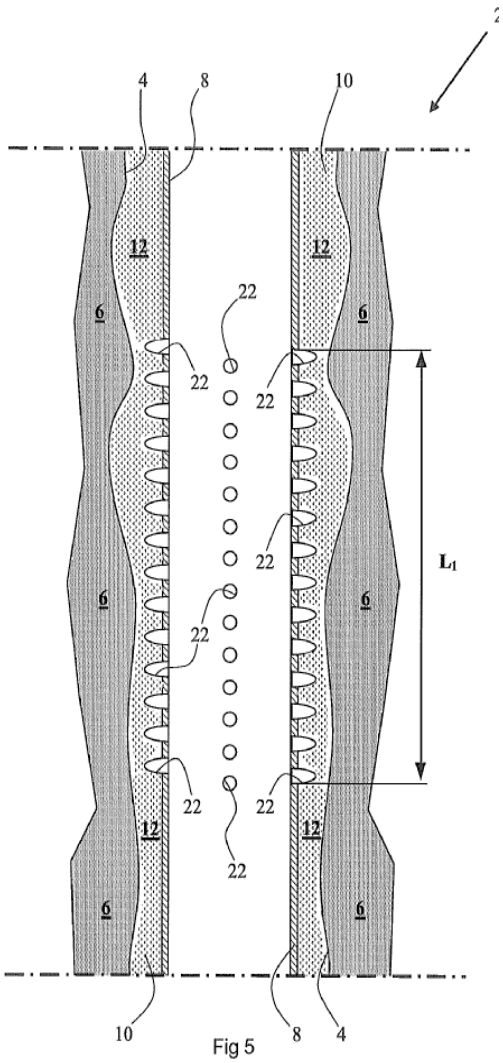

Fig 5

Figs 4 and 5 show the steps of lowering a perforating tool 18 into a casing 8 and causing perforations 22 to be formed through the casing 8 into the annulus 10.

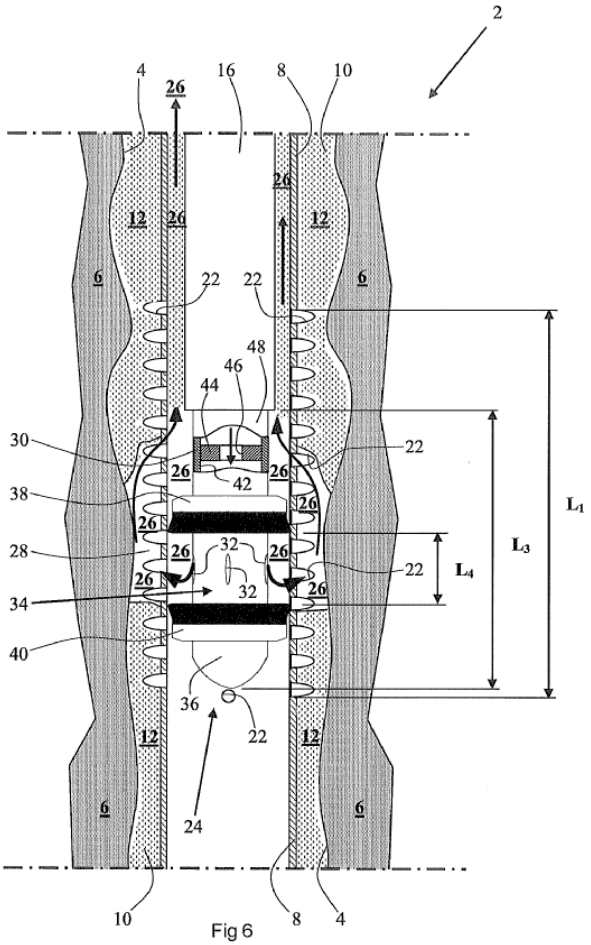

Fig 6

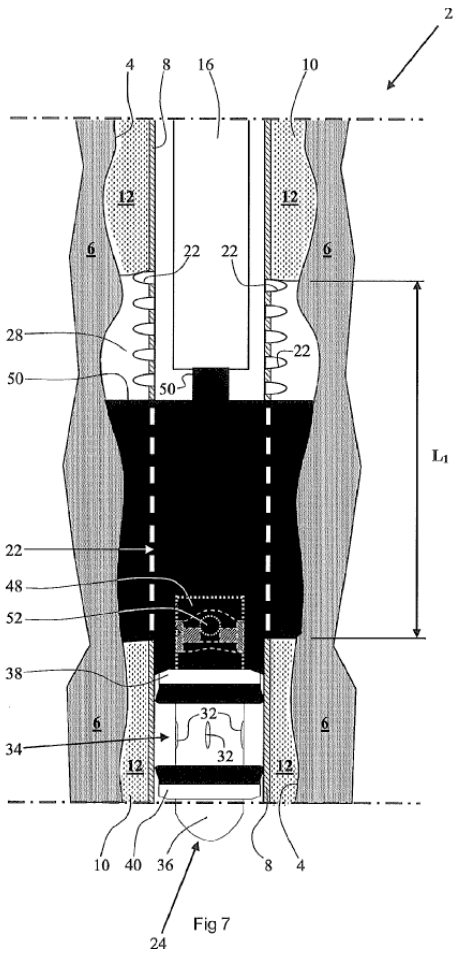

Fig 7

Fig 6 shows the use of a washing tool 24 which directs washing fluid through perforations 22 out in to the annulus 10 and back into the casing 8. Fig 7 shows the step of inserting plugging material 50 into the casing 8 and which exists via perforations 22 to also plug the annulus 10.

Claim construction

17. There has been a considerable amount of discussion regarding what various aspects of the claim actually mean and I shall consider these in turn, following the guidance set out in *Kirin-Amgen and others v Hoechst Marion Roussel limited and others [2005] RPC 9*. The key point being “what a person skilled in the art would have thought the Patentee was using the language of the claim to mean”. I will therefore interpret these aspects of the claim in a purposive manner and interpret them in light of the descriptions and drawings, taking in to account the Protocol to article 69 of the EPC.

A method for combined cleaning of an annulus (10) in a well (2) across a

longitudinal section (L1) of the well (2), and subsequent plugging of the longitudinal section (L1),

18. In the above phrase the observer argues that plugging of the longitudinal section means that the well is plugged across its full cross section. The requester disputes this and argues that further casings could be present and the annulus could be disposed between two casings. In support of this the requester refers to page 1, lines 5-7 of the description where it states that the "annulus is located outside a casing in the well and may be restricted, at the outside thereof by another casing or by surrounding rocks". I agree with the requester this does cast some doubt on the claims, however, on balance, I do not think this is how the person skilled in the art would interpret the invention in the context of the application. This is the only part of the application where it is mentioned that a further outer casing may be present and said phrase makes no mention of only plugging up to the inside of the outer casing . The remainder of the application makes it very clear that the entire well is plugged. The discussion under "Background of the Invention" on page 1 of the Patent refers to statutory regulations relating to pressure isolating during abandonment of the well. The entire description of the invention refers only to a single casing and the drawings show only a single casing and where the plug plugs the cross-section of the well to the formation wall. Taking a purposive construction of the claims I agree with the observer that the person skilled in the art would understand the claims to mean the well is plugged across its entire cross section.

by means of the perforation tool (18; 18'), forming holes (22) in the casing (8) along the longitudinal section (Li),

19. The requester has argued that the holes need not be "new holes" as argued by the observer but may have been present for some time. I agree with the requester that the holes may be present before washing and plugging occurs, formed, for example, by a perforation tool run in separately to the cleaning and plugging tool. The invention, as claimed, does however require that the holes are formed as part of the cleaning and plugging operation even if that means they are formed by a separate tool before cleaning and plugging occurs. I do not agree the skilled person would interpret the claims to mean the holes could have been previously formed in some other operation and then made use of in the cleaning and plugging operation.

20. The requester also refers to the phrase *"placing fluidised plugging material in the casing..."*. In relation to this phrase the requester argues there is nothing in the Patent to support the observer's assertion that the placement of the cement in the annulus is unpressurised. I agree with the requester that there does not appear to be any explicit teaching about whether or not the cement placement is a pressurised process and I do not think the person skilled in the art would understand the claims to be limited to unpressurised placement of the cement.

Nelson

21. This document relates to well cementing, specifically two different types of cementing, plug cementing and squeeze cementing and there has been a great deal of argument from both the requester and observer about the meaning of these terms so I need to outline what in my opinion the skilled person would understand the document discloses.

22. The two parties have very different views on what this document discloses but in essence it is the requester's view that it describes remedial cementing operations of two categories, namely squeeze cementing and plug cementing. The requester goes on to note that "a squeeze job is a type of cementing operation" and that "squeeze cementing consists of forcing cement slurry through holes, splits or fissures in the casing/wellbore annular space". The requester further refers to "before a well can be abandoned, annular leaks must first be sealed. Squeeze cementing techniques are applied for this purpose". The requester summarises the document "the squeeze job is a process that can be performed for a number of reasons...one of the processes is well abandonment which includes the provision of a cement plug and the squeeze job itself. Thus it is clear that the document teaches a method for the combined cleaning of an annulus in a well across a longitudinal section and the subsequent plugging of the annulus and wellbore along the longitudinal section."

23. The observer disputes the requester's analysis of Nelson and states that "It is essential to realise that Nelson differentiates between "plug cementing" and "squeeze cementing. The way these terms are used by Nelson "plug cementing" methods are aimed at simply "placing" cement plugs within a cased-hole section and/or open hole section of a well, whereas "squeeze cementing" methods are aimed at forcing/squeezing ...cement slurry into holes, splits fissures in the annular space outside a casing. Furthermore, the "squeeze cementing" part of Nelson does not discuss problems associated with plugging and abandoning wells nor does it discuss methods that can be applied for this purpose. In contrast to the claimed method, Nelson does not describe any method aimed for or suitable for plugging and sealing the full cross section of a well."

24. It is therefore necessary for me to come to an opinion as to which interpretation the skilled person would arrive at from reading Nelson.

25. Nelson, in the introduction, sets out problems and solutions to various cementing operation. It begins "Remedial cementing is a general term to describe operations that employ cementitious fluids to cure a variety of well problems. Such problems may occur at any time during the life of the well, from well construction, to well stimulation, production and abandonment. Remedial cementing is commonly divided into two broad categories: plug cementing and squeeze cementing. Plug cementing consists of placing cement slurry in a wellbore and allowing it to set. Squeeze cementing consists of forcing cement slurry through holes, splits, or

fissures in the casing/wellbore annular space. This chapter describes each category and provides fundamental procedures and practices."

26. It is therefore clear that Nelson considers squeeze cementing and plug cementing to be different processes. This is an important distinction and I will refer to it again later.

27. I should emphasise that the distinction between squeeze cementing and plug cementing is made throughout Nelson, for example plug cementing tools and techniques are discussed in section 14-3 to 14.6. Squeeze cementing is introduced in 14-7 to14.17 under the title "Squeeze cementing-Introduction".

Novelty

28. The requester notes that on page 530 in section 14.9.7 that Nelson states that a "perforation washing tool is used before a squeeze job... and that it is clear that the document teaches a method for the combined cleaning of an annulus in a well across a longitudinal section and the subsequent plugging of the annulus and wellbore along the longitudinal section." Nelson does mention perforation washing but in the context of the squeeze job. As I have discussed earlier, Nelson is clear that a squeeze job and a plugging operation are not the same process.

29. Claim 1 requires a method for combined cleaning of an annulus in a well across a longitudinal section of the well and subsequent plugging of the longitudinal section...by means of a washing tool attached to a lower portion of a flow-through tubular work string and...pumping fluidized plugging material down the tubular work string and out into the casing at the longitudinal section and placing the fluidized plugging material in the casing and hence the annulus...This, in my opinion, is not disclosed by Nelson.

30. The requester's argument that Nelson discloses a possible scenario where a perforation washing tool is used before a squeeze treatment before plugging of the well is noted but claim 1 requires the washing step be part of a plugging operation, as opposed to being part of the squeeze treatment as disclosed in Nelson. Furthermore, claim 1 requires that that the washing tool is "attached to a lower portion of a flow-through tubular work string and conducted into the casing to the longitudinal section, pumping a washing fluid down through the tubular work string and out into the casing via the washing tool...and...pumping fluidized plugging material down through the tubular work string and out into the casing at the longitudinal section. With reference to the washing procedure the requester makes reference to Nelson 530, 14-9.7. This section describes a washing procedure before a squeeze job. It does not mention the washing tool being positioned on the string that will be used for the plugging operation.

31. It should be noted that in the observations in reply the requester refers to page 540 of Nelson, paragraph 14-15 “a squeeze job can and sometimes does result in a plug within the casing itself” and that “When perforations and casing leaks are squeezed, the excess cement remaining inside the casing may be cleaned up before it sets or drilled out after it sets...”. Neslon does indeed say this but the quote has been taken from a section titled “Clean up after a squeeze job”. The section is entirely concerned with removing cement that has been deposited in the casing, as discussed in the opening paragraph 14-15 “Removing the excess cement before setting provides a clear benefit in terms of cost and time...” It is my opinion that contrary to the arguments proposed by the requester, paragraph 14-15 does not support plugging the casing during a squeeze treatment, in fact it would lead the skilled person away from such a process as it discusses problems and solutions to removing excess cement from the casing which has occurred during a squeeze job, as opposed to plugging the casing.

32. For at least these reasons it is my opinion the Patent is novel in light of Nelson.

33. Turning to Kinney. Kinney describes a method and apparatus for completing an unconsolidated formation in a single trip. It does this by use of a casing perforation device, a packer and a sand screen whereby a mixture of gravel and fluid is flowed into the borehole and where gravel is deposited at a screen annulus. The requester argues the document shows a means by which a well may be cleaned and plugged but the observer argues that the document discloses a different operation than is disclosed in the Patent, namely a gravel packing operation. I agree with the observer, Kinney discloses a gravel packing operation. It is my opinion the skilled person would not interpret Kinney to be a washing and plugging operation as understood by the skilled person reading the Patent. There is simply no discussion in Kinney of plugging a casing and annulus as described in the Patent. The formation of the gravel pack in Kinney is to assist in hydrocarbon production, for example with reference to the tool and gravelling operation Kinney states “The tool is next manipulated into the production configuration whereupon formation fluid flows through the perforations, through the gravel and screen and up the tubing string, thereby completing the well in a single trip”. Production is further mentioned multiple times in Kinney and this is the opposite of what is claimed in the Patent which relates to plugging and preventing hydrocarbon flow.

34. At least for this reason it is my opinion the claims are novel with respect to Kinney.

Inventive step

35. I note the observations made by the observer regarding a “long felt need” and the counter arguments made by the requester. I also confirm I shall ensure I do not

use ex post facto analysis and instead I shall take the following approach in assessing Inventive Step.

In the UK the law to determine whether or not an invention defined in a particular claim is inventive over the prior art and that which I must follow is set out in *Pozzoli SPA v BDMO SA [2007] EWCA Civ 588*, in which the well known Windsurfing steps were reformulated:

> *(1)(a) Identify the notional "person skilled in the art";*
> *(1)(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, determine whether those differences constitute steps which would have been obvious to the person skilled in the art.*

36. The requester has described the person skilled in the art and as this has not been disputed by the observer I have accepted that requester's description which is "an unimaginative well engineer possessing common general knowledge and being aware of the basic technologies involved in treating, cementing and sealing wells. Indeed, the skilled team in this area would be large and include some or all of an operation supervisor, a gun perforation engineer and a perforation washing engineer, a cementing operator and the drilling crew itself."

37. The inventive concept of the claim is a combined cleaning of an annulus in a well across a longitudinal section of the well and subsequent plugging of the longitudinal section, the annulus being located outside a casing section, by means of conducting a perforation tool into the well for forming holes in the casing and by means of a washing tool attached to a portion of a flow through tubular work-string, conducting the washing fluid outward into the annulus and outward into the casing via the holes and pumping a fluidised plugging material down the work-string out into the casing and also into the annulus via said holes whereby both the casing and the annulus is plugged.

38. The matter cited as forming the state of the art seems to have been set out in McKenzie, as described in the Patent in a section titled "Prior art and disadvantages thereof". McKenzie shows an apparatus and method whereby a casing is perforated and plugging material is directed into the casing and out through the perforations to plug the casing and an annulus outside the casing. The difference between the state of the art would seem to be that in the Patent the method involves combined washing and plugging and directing cleaning fluid through the holes in the casing and out into the annulus. This difference has in essence been identified by the proprietor of the Patent in the aforementioned section of the Patent and the requester also refers to the washing step as a difference, specifically " ...MacKenzie already contemplates the circulation of a fluid before application of cement and

would therefore simply make the small step of deciding to wash before the actual cementing".

39. The requester has argued that this difference is not inventive in light of the teaching of Nelson but the observer disputes this and argues that the requester's arguments rely heavily on ex-post facto analysis, in other words, the use of hindsight.

40. The washing step the requester identified in Nelson relates to the squeeze treatment operation described in Nelson. I have set out earlier why I believe the squeeze treatment operation in Nelson is not the same as a plugging operation, however I agree with the requester that the skilled person would be aware of the document. In Nelson, in the passage identified by the requester relating to the washing step states that "Perforation washing before the squeeze job helps to render all perforations receptive to the squeeze cement slurry". Perforation washing and the tools used are also discussed on pages 529 and 530 of Nelson. The question that has to be answered is therefore would be it obvious at the time of the Patent to include a washing step during a plugging operation? In Nelson it is clear that the washing step is associated with cleaning perforations in the formation to make them receptive to the squeeze operation "Perforation washing before a squeeze job is a useful method for making all perforations receptive to the squeeze cement slurry. This can be done by mechanical or chemical means". The requester also notes (in the section of the request referring to a lack of Novelty) that "A wash fluid is pumped down the tubing and forced into the perforations. It is then forced outside the casing and back through upper perforations into the annulus". It does however seem that the annulus being referred to in this passage (and in fig 14.34) is the annulus between the cleaning tool and the inside of the casing and not the annulus outside the casing as is stipulated in claim 1 of the Patent.

41. The claim of the Patent requires that the washing fluid travels down the work-string, through the holes created in the casing and out into an annulus outside the casing. Apart from the passages of Nelson I have referred to above the requester has not identified where in Nelson such a flow path of the cleaning fluid is discussed and furthermore the requester has not identified where in Nelson there is disclosed a washing tool disposed on a lower portion of the work-through string which is used to convey the plugging material. I am not able to identify these features either so it is my opinion that even if the person skilled in the art were to combine Nelson with the state of the art as exemplified by McKenzie claim 1 would still not be arrived at and for that reason it is my opinion that claim 1 is inventive in light of Nelson.

42. Turning to Kinney, this document describes a method and apparatus for completing an unconsolidated formation in a single trip. It does this by use of a casing perforation device, a packer and a sand screen whereby a mixture of gravel and fluid is flowed into the borehole and where gravel is deposited at a screen annulus. The requester argues the document shows a means by which a well may

be cleaned and plugged but the observer argues that the document discloses a different operation than is disclosed in the Patent, namely a gravel packing operation. I agree with the requester that the skilled person, as identified would be aware of the teaching of this document however it is totally silent on the use of a washing step to prepare for a plugging operation. It also does not disclose a washing tool disposed on a lower portion of the work-through string which is used to convey the plugging material. It therefore follows that even if the teaching of Kinney was combined with state of the art, claim 1 would not be arrived at.

43. Turning to Vann. Vann was only discussed by the requester in relation to appendant claims and no argument was supplied by the requester suggesting it is relevant to claim 1. In light of the above it is not necessary I consider it any further.

Opinion

44. It is my opinion that claim 1 of the Patent is novel and inventive in light of the evidence supplied to me.

45. Claims 2-17 are appendant to claim 1and it therefore follows they are also novel and inventive.

Lyndon Ellis
Examiner

NOTE

This opinion is not based on the outcome of fully litigated proceedings. Rather, it is based on whatever material the persons requesting the opinion and filing observations have chosen to put before the Office.