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**Datasheet for the decision
of 22 March 2016**

Case Number: T 0308/14 - 3.3.09

Application Number: 03768889.2

Publication Number: 1578879

IPC: C09J133/02, D04H1/64,
C03C25/28, C03C25/32, B32B17/10

Language of the proceedings: EN

Title of invention:
EXTENDED POLYACRYLIC ACID BASED BINDER COMPOSITIONS

Patent Proprietor:
OWENS CORNING

Opponent:
Rohm and Haas Company

Headword:

Relevant legal provisions:
EPC Art. 83, 56, 111(2)

Keyword:

Finding of fact in appeal binding in subsequently resumed
opposition proceedings
Sufficiency of disclosure - (yes)
Inventive step - alternative with inferior properties (no)

Decisions cited:

T 0843/91, T 0153/93, T 1115/10

Catchword:

If, in appeal proceedings, a case is remitted to the
opposition division after the board has taken a decision under
Article 84 EPC on the clarity of a certain feature in a claim
- in the present case the weight average molecular weight of
polysaccharides - this decision is res judicata and thus
binding on the opposition division in the subsequently resumed
opposition proceedings. The binding effect does not only cover
the decision on Article 84 EPC as such; it also extends to any
finding of fact that led to this decision. Therefore, if in
the resumed opposition proceedings an insufficiency objection
is made under Article 83 EPC on the basis that this very
feature is ambiguous (insufficiency arising out of ambiguity),
the opposition division should not reopen the discussion of
whether this feature is clear, and should accept any finding
of fact the board made in arriving at its decision on
Article 84 EPC (point 1 of the Reasons).



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Case Number: T 0308/14 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 22 March 2016

Appellant: OWENS CORNING
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 10 December
2013 revoking European patent No. 1578879
pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman W. Sieber
Members: M. O. Müller
F. Blumer

Summary of Facts and Submissions

- I. This decision concerns the appeal filed by the proprietor of European patent No. 1 578 879 against the decision of the opposition division of 10 December 2013 to revoke it.
- II. With the notice of opposition, the opponent had requested revocation of the patent in its entirety on the grounds under Article 100(a) (lack of novelty and inventive step), 100(b) and 100(c) EPC.
- III. The documents submitted with the notice of opposition included:
- D1: US 5,895,804;
- D2: Material Safety Data Sheet for "Westco Waxy Maize", 4 pages;
- D4: WO 02/077038 A2; and
- D5: GB 1 293 744 A.
- IV. In a first decision dated 19 March 2010, the opposition division decided to revoke the patent since claim 12 of the main (and sole) request did not meet the requirements of Article 123(2) EPC.
- V. The proprietor appealed this decision and pursued the case on the basis of a main request and first and second auxiliary requests.

Claim 1 of the second auxiliary request read as follows:

"1. An aqueous binder composition for coating glass fibers comprising:

a polycarboxy polymer;

a poly alcohol having at least two hydroxyl groups;
and

a water-soluble extender selected from a group consisting of lignin, polysaccharides having a weight average molecular weight of not more than 10,000, proteins and sulfonated lignins, the extender being present in an amount sufficient to establish an extender-polycarboxy polymer weight ratio of at least 1:10."

VI. In its decision T 1115/10, the board held that the main request and the first auxiliary request did not meet the requirements of Article 123(2) EPC. The board further decided that the second auxiliary request met the requirements of Rule 80 EPC and Articles 84, 123(2)/100(c) and 123(3) EPC and, as requested, remitted the case to the opposition division for further prosecution on the basis of this auxiliary request. As regards Article 84 EPC, the board held that, taking into account the evidence on file, the weight average molecular weight of not more than 10 000 of the polysaccharides in claim 1 of the second auxiliary request was clear since it did not depend on the measurement method applied.

VII. In the subsequently resumed opposition proceedings, the proprietor pursued the previous second auxiliary request (see point V above) as main request.

The opponent raised objections under Articles 83, 54 and 56 EPC and filed

Annex A: Test results about the measurement of molecular weight averages of polysaccharides.

VIII. As the proceedings went on, the parties filed the following further documents:

Proprietor:

P1: EP 1 760 125 B1;

P2: EP 0 877 076 B1;

P3: EP 0 812 905 B1;

P4: EP 0 875 142 B1;

P5: EP 0 849 315 B1;

P6: EP 0 658 608 B1;

D13a: S.E. Harding et al., *Advances in Carbohydrate Analysis*, volume 1, 1991, pages 63, 64, 116 to 124 and 138 to 144;

D14: F. Avaltroni et al., *Carbohydrate Polymers*, volume 58, 2004, pages 323 to 334; and

D15: P. Dokic et al., *Colloids and Surfaces A: Physiochemical and Engineering Aspects*, volume 141, 1998, pages 435 to 440.

Opponent:

D13a': Full copy (pages 63 to 144) of D13a;

D16: D.R. White, Jr, chapter 21 "Application of Gel Permeation Chromatography with Multi-Angle Light Scattering to the Characterization of Polysaccharides" in Polysaccharide Applications, M. El Nokaly et al. (ed.), ACS Symposium Series, American Chemical Society, Washington DC, 1999, pages 299 to 316;

D17: T. Kato et al., Journal of Chromatography, volume 256, 1983, pages 61 to 69;

D18: M. Kurata et al., "Viscosity - Molecular Weight Relationships and Unperturbed Dimensions of Linear Chain Molecules" in Polymer Handbook, J. Brandrup et al. (ed.), fourth edition, 2005, pages VII/1 to VII/6, VII/43 and VII/46; and

D19: Declaration of M.D. Kelly signed on 13 September 2013 (denoted Annex A - declaration).

IX. During the oral proceedings before the opposition division, the proprietor filed an auxiliary request in which the polysaccharide extender in claim 1 had been deleted.

X. In its second decision, the opposition division admitted D19 (and reference documents D16 to D18) and P1 to P6 into the proceedings.

The opposition division decided that the main request did not fulfill the requirements of Article 83 EPC,

essentially reasoning as follows: in view of D13a (denoted D13 in the decision), Annex A and D19, multiple measurement methods for the determination of the weight average molecular weight existed and the values obtained depended on the type of method applied. The opposed patent did not however identify any method of measurement, even though this was essential to enable the skilled person to work claim 1 with regard to choosing the polysaccharides.

The auxiliary request was rejected as not inventive. Aqueous binder compositions comprising a polycarboxy polymer and a poly alcohol for coating glass fibres were known, e.g. from D1 and D4. The differentiating feature of claim 1 was the presence of a water-soluble extender selected from lignin, proteins and sulfonated lignins in a certain minimum weight ratio. As evidenced by D5, lignins had been well-known extenders in the field of aqueous fibre glass binding resin compositions for at least four decades.

In this respect, the opposition division noted that the binder performance worsened upon addition of the extenders, e.g. the recovery at end of line (EOL) decreased compared to an extender-free binder composition. Also figure 2 of the patent demonstrated that certain binder properties at least did not improve when a lignin extender was added to the binder composition.

XI. On 7 February 2014, the proprietor (hereinafter: the appellant) appealed the above decision. On 17 April 2014, the appellant filed its statements setting out the grounds of appeal, together with

D20: Product sheet "NUTRIOSE®: Analytical Aspects",

1 page;

D20a: Press release from 2013 concerning NUTRALYS® and NUTRIOSE®, 2 pages;

D21: S. Zhou, Technical report "Cargill maltodextrin profile", 2012, 8 pages;

D22: S. Mori et al., "Size Exclusion Chromatography", Springer 1999, 16 pages;

D23: "HPLC Practical and Industrial Applications", J. Swadesh (ed.), Boca Raton, London 1997, 63 pages;

D24: Y. Suk Baik et al., Bull. Korean Chem. Soc., volume 28(5), 2007, pages 847 to 850; and

D25: DIONEX Application Note 83 "Size-Exclusion Chromatography of Polysaccharides with Pulsed Amperometric Detection (PAD)", 2001, 6 pages.

The appellant requested that the appealed decision be set aside and that the patent be maintained on the basis of the main or auxiliary request before the opposition division.

XII. With its letter of 27 August 2014, the opponent (hereinafter: the respondent) filed a reply.

XIII. By its communication dated 29 September 2015, the board summoned the parties to oral proceedings and issued its preliminary opinion. The board observed that the question of whether the opposition division's decision on sufficiency was a ruling on *res judicata* needed to be discussed during the oral proceedings. The board

furthermore commented on inventive step. The polysaccharide alternative of claim 1 differed from the composition in table 4b of D1 only in terms of the weight average molecular weight of the polysaccharide, and it needed to be discussed during the oral proceedings what problem was solved by this feature and whether in view of this problem the selection of the weight average molecular weight as required by claim 1 was obvious. As regards the sulphonated lignin alternative of claim 1, the board observed that, if the problem addressed in the patent was not solved or not solved over the entire scope of claim 1, the objective technical problem had to be reformulated in a less ambitious manner as the provision of an alternative binder composition. Since the addition of lignin sulphonate was already known from D5, the claimed binder alternative would in this case lack inventive step in view of either D1 or D4 in combination with D5.

XIV. With its letter dated 22 February 2016, the appellant refiled the previous main request and filed new first to third auxiliary requests as well as copies of T 153/93, T 210/11 and

D26: Dynamic mechanical analysis data, 2 pages.

XV. With letter dated 4 March 2016, the respondent requested that the first and third auxiliary requests and D26 not be admitted into the proceedings and that if the board did admit any of these requests, the oral proceedings be adjourned. The respondent furthermore requested an apportionment of costs for having to consider the appellant's late submissions.

XVI. On 22 March 2016, oral proceedings were held before the board. During the oral proceedings, the appellant

withdrew the first and third auxiliary requests and filed a fourth auxiliary request. The respondent requested that this auxiliary request not be admitted into the oral proceedings. At the end of the oral proceedings, the respondent withdrew its request for apportionment of costs.

The claims of the main request are identical to the claims of the second auxiliary request in T 1115/10 (see point V above).

Claim 1 of the second and fourth auxiliary requests reads as follows (amendments over the main request in bold type):

Second auxiliary request

"1. An aqueous binder composition for coating glass fibres comprising:

a polycarboxy polymer;

a poly alcohol having at least two hydroxyl groups;
and

a water-soluble extender selected from a group consisting of lignin, ~~polysaccharides having a weight average molecular weight of not more than 10,000,~~ proteins and sulfonated lignins, the extender being present in an amount sufficient to establish an extender-polycarboxy polymer weight ratio of at least 1:10."

Fourth auxiliary request

"1. An aqueous binder composition for coating glass fibres comprising:

a polycarboxy polymer;

a poly alcohol having at least two hydroxyl groups; and

a water-soluble extender ~~selected from a group consisting of lignin, which is a~~ polysaccharides having a weight average molecular weight of not more than 10,000, ~~proteins and sulfonated lignins,~~ the extender being present in an amount sufficient to establish an extender-polycarboxy polymer weight ratio of at least 1:10."

XVII. So far as relevant to the present decision, the appellant's arguments can be summarised as follows:

Main request

The respondent's sufficiency objection as regards the weight average molecular weight of the polysaccharides could not succeed since the question whether this feature was clear had already been decided by the board in T 1115/10 and thus was *res judicata*.

The sulphonated lignin alternative of claim 1 was inventive. Contrary to the respondent's assertion, D1 rather than D4 constituted the closest prior art. Irrespective of this, the sulphonated lignin alternative was inventive also when starting from D4, from which it differed in terms of the

presence of the water-soluble sulphonated lignin extender. The problem solved in view of D4 was the provision of a further binder composition with acceptable physical properties and, in addition, improved applicability for scaling up. The examples of the patent showed that this problem was solved by the incorporation of the sulphonated lignin extender. In particular figures 1 and 2 proved that the addition of up to 45 wt% of extender did not significantly change the cure performance of the binder composition, and table 1 showed that the recovery of the cured extended binder was acceptable. In fact, the cure performance of the binder with 45% extender was better than that with 15% extender. This would not have been expected by the skilled person. Furthermore, the burden of proof to show that the problem of providing binder compositions with acceptable physical properties was not solved rested on the respondent, who had not provided any data. Contrary to the respondent's assertion, the skilled person would not use the extender of D5 in the binder of D4, since D5 related to phenol-formaldehyde binders. The skilled person would not take the teaching of D5 and transfer it to a different binder. Furthermore, the sulphonated lignin in D5 was only disclosed in combination with urea, and there was no reason why the skilled person should use the sulphonated lignin without urea and include it in the binder of D4. However, using a combination of urea and the sulphonated lignins would not lead to the subject-matter of claim 1 since this claim excluded the presence of additional extenders.

Fourth auxiliary request

The fourth auxiliary request should be admitted into the proceedings. This request had not been filed earlier since the discussion so far had focused on sufficiency of disclosure rather than on the inventive step of the polysaccharide alternative.

The subject-matter of the fourth auxiliary request was inventive. It differed from the closest prior art D1 in terms of the weight average molecular weight and water solubility of the polysaccharide. In this respect, D2 was not enough proof that the waxy corn starch of D1 was water-soluble. The problem solved in view of D1 was the provision of another binder composition. D1 taught away from the low molecular weight as claimed, since this led to discolouration and a low tensile strength. D1 furthermore taught away from using a polysaccharide that was water-soluble, since according to D1 this led to a low degree of crosslinking.

XVIII. So far as relevant to the present decision, the respondent's arguments can be summarised as follows:

Main request

The invention as defined in the main request lacked sufficiency of disclosure. The patent failed to provide a method for measuring the weight average molecular weight of the polysaccharide extender, and different methods gave different results. The board's earlier decision T 1115/10 was no bar against considering sufficiency of disclosure, since in that decision

the board had decided on whether claim 1 satisfied Article 84 EPC rather than Article 83 EPC. Furthermore, there had been very little time during the first appeal proceedings to make a proper insufficiency attack against the weight average molecular weight of the polysaccharide. This attack had thus not been filed late, so the opposition division was correct in taking it into account and reaching the decision that sufficiency had to be denied.

The subject-matter of claim 1 lacked inventive step. D4 constituted the closest prior art, since it was in the field of binders for glass fibres. In fact the binder composition disclosed in D4 was taken as the comparative binder composition in the opposed patent. As illustrated by the data in the patent, the addition of the sulphonated lignin extender resulted in a deterioration of the binder properties in all aspects. The problem solved in view of D4 was thus just to provide another binder, irrespective of its properties. This was not changed by the fact that the performance of the binder with 45% extender was better than that with 15%, since the claim was not restricted to extender amounts of 45%. It was also not true that the burden of proof to show that no acceptable physical properties were obtained was on the respondent, because it had discharged this burden by using the data present in the patent. The improvement of the applicability for scaling up, referred to by the appellant, could not be taken into account since the appellant had not provided any data supporting such an improvement. The claimed solution was nothing more than what common sense dictated, namely that the addition of a

diluent diluted the binder properties. Furthermore, D4 itself already suggested the addition of an extender (filler) in an amount not exceeding about 20%, and from D5 the skilled person would learn that ammonium lignosulphonate could be used as an extender. The skilled person thus would incorporate the extender of D5 in the binder of D4, irrespective of whether the binder properties deteriorated as a result. In this respect, ammonium lignosulphonate was disclosed in D5 as such, rather than in combination with urea as asserted by the appellant. The claimed subject-matter thus lacked inventive step over D4 in combination with D5.

Fourth auxiliary request

The fourth auxiliary request should not be admitted into the proceedings. This request diverged from the previous requests, which had all contained the sulphonated lignin alternative. The respondent could not have foreseen the restriction to the polysaccharide alternative and thus the need to prepare for such a request.

The fourth auxiliary request was furthermore not inventive. The subject-matter of claim 1 differed from the closest prior art D1 only in terms of the weight average molecular weight of the polysaccharide. The polysaccharide in D1 was water-soluble, as proven in D2, so the feature "water-soluble" in claim 1 was not a further distinguishing feature. The problem solved in view of D1 was the provision of another binder. The claimed solution was already disclosed in D1 itself which disclosed a polysaccharide with a

weight average molecular weight of 10 000. It was in this respect irrelevant whether D1 stated that a low molecular weight of the polysaccharides had certain disadvantages, since the skilled person was looking for another binder irrespective of its properties. The same applied to any disadvantages allegedly attributed in D1 to water-soluble polysaccharides.

XIX. During the oral proceedings, the board commented on the admissibility of the fourth auxiliary request and observed that the respondent should have been prepared to discuss the polysaccharide alternative in claim 1 of this request because (i) the respondent itself had discussed this alternative in its response to the statement of grounds of appeal, (ii) a discussion of this alternative during the oral proceedings had been announced in the board's preliminary opinion, and (iii) the appellant had thereafter filed D26, figure 3' of which related to the polysaccharide alternative.

XX. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of

- the main request before the opposition division refiled with letter dated 22 February 2016; or subsidiarily
- the second auxiliary request filed with letter dated 22 February 2016; or
- the fourth auxiliary request filed during the oral proceedings before the board.

The appellant furthermore requested that the opposition division's decision to admit D19 (and reference documents D16 to D18) into the proceedings be set aside.

XXI. The respondent requested that the appeal be dismissed.

The respondent also requested that the fourth auxiliary request not be admitted.

The respondent furthermore requested that D26 not be admitted into the proceedings and in the event that the board admitted this document, the oral proceedings be adjourned.

The respondent furthermore requested that the appellant's request as regards the admissibility of D19 (and reference documents D16 to D18) be refused.

Reasons for the Decision

Main request

1. Article 83 EPC

1.1 The present appeal is the second appeal in this case. In decision T 1115/10 (point 9.3) on the first appeal, the board held that the feature "polysaccharides having a weight average molecular weight of not more than 10000" in claim 1 of the then second auxiliary request complied with Article 84 EPC. The board in particular reasoned as follows:

"... no proof has been provided that the alleged dependence exists also for these low weight average

molecular weights. In the absence of any such proof, it can be assumed in the appellant's favour that the weight average molecular weight of not more than 10 000 in claim 1 does not depend on the measurement method. The inclusion of this weight average molecular weight in claim 1 therefore does not infringe the requirements of Article 84 EPC."

Hence, decision T 1115/10 contained the finding of fact that the weight average molecular weight of not more than 10 000 in claim 1 was clear in terms of Article 84 EPC since, taking into account the evidence on file, it did not depend on the measurement method applied.

- 1.2 After the board had remitted the case to the opposition division, various documents including D13a and D19 (D13a was denoted "D13" and D19 was denoted "Annex A - declaration" in these proceedings) were filed. The respondent argued on the basis of these documents that, in as far as the polysaccharides with a weight average molecular weight of not more than 10 000 were concerned, the invention lacked sufficiency of disclosure. In its decision, the opposition division agreed and reasoned that in view of D13a and D19 there were multiple measurement methods for the determination of the weight average molecular weight, and that the values so obtained depended on the type of method applied. The opposition division therefore decided that the main request (identical to the second auxiliary request in T 1115/10) did not comply with Article 83 EPC. The opposition division's decision was thus a decision on insufficiency arising out of ambiguity, namely the ambiguity of the weight average molecular weight in claim 1.

1.3 As set out above, it had already been finally decided in T 1115/10 that the requirements of Article 84 EPC were met. This decision constituted *res judicata* and thus was binding on the opposition division in the subsequently resumed opposition proceedings (Article 111(2) EPC). It was a matter of dispute between the parties whether the opposition division's decision on sufficiency contravened this binding effect of T 1115/10. The respondent argued that decision T 1115/10 only concerned Article 84 EPC and therefore did not bind the opposition division in its decision on Article 83 EPC.

The board does not agree. The binding effect of decision T 1115/10 does not only concern the decision on Article 84 EPC as such but extends to any finding of fact that led to this decision (T 843/91, headnote and point 3.4.2 and T 153/93, points 2 and 3), i.e. in the present case the finding that the weight average molecular weight in claim 1 did not depend on the measurement method. Therefore, the opposition division should not have reopened the discussion on this finding of fact when deciding whether any alleged ambiguity of the weight average molecular weight in claim 1 led to insufficiency, but should have accepted this finding as it stood. By not doing so, the opposition division violated the principle of *res judicata* and jeopardised the general interest of the public in the settlement of legal disputes.

1.4 This is not changed by the statement in the opposition division's decision (point 19.3) that "In T 1115/10 the board already expressed their concern about a possibly inconsistent measurement situation regarding Mw below 10 000 (p. 21-22, bridging paragraph)." This statement misinterprets decision T 1115/10, since a concern was

expressed, if at all, only for high molecular weights namely 500 000 or above (first sentence of the last paragraph on page 21 of the decision).

- 1.5 The respondent argued that it had had very little time during the first appeal proceedings to make a proper insufficiency attack against the weight average molecular weight, and that it had completed this attack as early as possible once the opposition proceedings were resumed. The opposition division was thus correct in taking this attack into account and in denying sufficiency of disclosure.

The board does not agree with this argument. Firstly, the respondent did not dispute that it had not raised any objection during the first appeal proceedings that it had not had sufficient time to make its attack on sufficiency of disclosure. In fact, no such objection appears in T 1115/10. Secondly, the assertion that the attack was completed as early as possible has no bearing on the fact that T 1115/10 was binding on the opposition division.

- 1.6 In view of the above, the weight average molecular weight in claim 1 must still be considered not to depend on the measurement method applied. Consequently, the respondent's insufficiency attack, which starts from the opposite assumption, cannot succeed.

- 1.7 The appellant had requested that the decision of the opposition division to admit D19 (and reference documents D16 to D18) into the proceedings be set aside. The board agrees that the opposition division should indeed not have admitted these documents, since they were filed in order to reopen the question whether the weight average molecular weight in claim 1 depended

on the measurement method. However, since, the respondent's insufficiency attack cannot succeed anyway, the board did not need to decide on the appellant's request.

2. Inventive step

2.1 The invention concerns binder compositions for the glass fibre industry that contain an extender so that they are less expensive while simultaneously maintaining acceptable strength and binding performance and/or improving one or more binder parameters (page 2, lines 7 to 10 and page 3, lines 50 to 52).

Claim 1 covers several extender alternatives, namely polysaccharides having a weight average molecular weight of not more than 10 000, proteins, lignin and sulphonated lignins.

2.2 It was a matter of dispute between the parties whether the subject-matter of claim 1, in as far as the sulphonated lignin extender was concerned (hereinafter: "the sulphonated lignin alternative"), involved an inventive step.

2.3 Like the opposed patent, D4 is directed to binder compositions for the glass fibre industry (page 1, lines 6 to 8). Therefore, in line with the respondent's arguments, it can be considered to represent the closest prior art.

The appellant argued that D4 was not in fact the closest prior art, since it addressed the problem of providing a binder composition with improved odour (page 1, line 8), which was different from the problem addressed in the opposed patent. In the appellant's

view, D1 rather than D4 was the closest prior art since, like the patent, it addressed the problem of finding a replacement for formaldehyde-based binders (column 1, lines 4 to 6).

The board acknowledges that D1 can also be considered to represent the closest prior art (for more details, see point 5.1 below). This does not however exclude D4 from being another suitable closest-prior-art document. In fact, the opposed patent uses a composition falling within the scope of claim 1 of D4 as a comparative binder composition (comparative example on page 6 of the patent) and this comparative binder composition is similar to one embodiment in synthetic example 2 of D4. Hence, the point of reference in the opposed patent is actually the teaching of D4. This underlines the fact that D4 can be taken as the closest prior art.

2.4 D4 discloses a binder composition for fibreglass comprising polyacrylic acid and a polyhydroxy crosslinking agent (claim 1). Synthetic example 2 discloses in one embodiment a blend of 75.0 parts of the polyacrylic acid Acumer[®] 9932 and 10.5 parts of 100% glycerine blended and diluted in water.

D4 does not disclose the use of a water-soluble, sulphonated lignin extender. The composition of claim 1 thus differs from D4 in that this extender is present.

2.5 During the oral proceedings, the appellant argued that the problem solved by the sulphonated lignin alternative of claim 1 was the provision of a further binder with acceptable physical properties and improved applicability for scaling up.

- 2.6 It was a matter of dispute between the parties whether this problem was solved by the claimed sulphonated lignin alternative.
- 2.7 The appellant has not provided any evidence that the sulphonated lignin alternative of claim 1 has an improved applicability for scaling up. Therefore, this partial problem cannot be considered to be solved.
- 2.8 In fact, the discussion during the oral proceedings concentrated on whether the partial problem of providing a further binder with acceptable physical properties was solved. In this respect, Example 1 and table 1 of the patent are of relevance.
- 2.8.1 Example 1 of the patent compares (i) a comparative binder composition containing polyacrylic acid and glycerol (denoted in the patent "PAGplus" or "PAG+"), with (ii) the same binder composition containing in addition the extender sodium lignin sulphonate LIGNOSITE[®] 260 in various amounts. The curing performance of the binder compositions was tested and is shown in figures 1 and 2.

In figure 1, the storage modulus measured by dynamic mechanical analysis is shown as a function of time and temperature. At a level of 15% extender ("PAG+-Lignin-15%"), which is within the claimed range, the plateau of the storage modulus lies at a value of about 3250 MPa. This value is about 25% lower than the plateau of the storage modulus of the unextended binder composition ("PAG+"), which is about 4300 MPa. Furthermore, compared to the unextended binder composition, the onset of cure (minimum after the first peak from the left in figure 1) is shifted to longer times for the binder composition with 15% extender.

Finally, the inclination and thus cure rate of the binder composition with 15% extender is lower than that of the unextended sample.

Figure 2 shows the oscillatory stress as a function of temperature. In this figure, the unextended binder composition ("PAG+") shows a steep increase in the oscillatory stress, starting at about 200°C and increasing to a value of 250 Pa at about 216°C (at this temperature the measurement was stopped). Unlike the unextended binder composition, the oscillatory stress for the binder composition with 45% extender ("PAG+ 45% Lignin") only barely increases and reaches at 216°C an end value of not more than about 24 Pa, which is ten times lower than the corresponding value for the unextended binder composition. Furthermore, here again the inclination of the curve, and thus the cure rate for the extended binder composition, is significantly less steep than for the unextended binder composition.

2.8.2 Table 1 relates to a trial using a polyacrylic acid glycerol binder both without and with the use of a lignin extender (PAGplus and PAGplus/lignin binders). The PAGplus binder was prepared by diluting a phosphite terminated polyacrylic acid glycerol resin premix with water, a hydrolysed silane and a dust suppressing agent to make a 10 wt% solid binder. For the PAGplus/lignin binder, sodium lignosulphonate was used to replace 10% of the weight of PAGplus binder in the binder composition. The binder compositions were then applied in a conventional manner during a standard fibre-glass insulation fiberising process and cured to produce a finished fibre-glass insulation batt. A standard phenolic binder was used on the same manufacturing line to produce comparative examples both before and after trial examples. Each of the trial and comparative

example fibreglass batts was then tested to ascertain its recovery at end of line ("EOL"), after one week under ambient conditions and in a humidity chamber and again after six weeks under ambient conditions or in the humidity chamber.

The recovery values in table 1 show that due to the addition of the sodium lignin sulphonate extender, the average of the recovery values is reduced, i.e. worsened, by 4.4%, namely from 5.97 (comparative PAGplus binder composition without sulphonated lignin extender) to 5.71 (PAGplus/lignin binder composition). This is more than five times higher than the average variation of only 0.8% for the standard phenolic binder before and after the trial examples - a variation which can be considered to represent experimental error.

2.8.3 The experimental data in the patent thus show that upon addition of a sulphonated lignin extender the physical properties of the binder composition deteriorate in all aspects, i.e. cure time, cure rate, tensile modulus and recovery. This deterioration is such that the extended binder composition can no longer be considered to have acceptable physical properties. The partial problem of providing a further binder with acceptable physical properties is thus not solved.

2.8.4 The appellant provided numerous counter-arguments in this respect:

(a) The variation obtained in the plant production trial due to the addition of the sulphonated lignin extender reflected acceptable binder properties since it was less than the variation observed when applying the phenolic binder at the start and the end of the experiment.

The board acknowledges that the variation of the recovery values obtained at the end of line (EOL) between the extended and unextended PAGplus binder is small compared to the variation between the phenolic resin at the start and end of this experiment. However, this variation concerns one single experiment only and therefore should be given less weight than the average of all values. As set out above (point 2.8.2), if the more relevant average of all values is considered, table 1 clearly reflects a significant decrease in recovery of the extended binder.

- (b) Even though the properties of the extended binder compositions deteriorated, this deterioration was not significant and thus the binder properties still acceptable.

The board does not find this argument convincing. There is no definition in the patent of what acceptable binder properties are. As set out above (point 2.8.1), the tensile modulus of a binder composition with 15% sulphonated lignin in figure 1 is decreased by an amount as high as 25%, and the end value of the oscillatory stress for a binder composition with 45% extender in figure 2 is ten times lower than the corresponding value for the unextended binder composition. These results hardly constitute binder properties that are still acceptable.

- (c) The cure performance of the binder with 45% sulphonated lignin extender was better than that with 15% extender and this would not have been expected by the skilled person.

The board acknowledges that the result obtained for 45% extender in figure 1 is indeed better than that with 15% extender. However, claim 1 is not restricted to an extender amount of 45% but covers values of 15%. The appellant's argument must thus fail.

- (d) The burden of proof to show that the problem of providing further binder compositions with acceptable physical properties was not solved rested on the respondent. In the absence of any such proof, the problem had to be assumed to be solved.

However, the respondent used the data in the patent to show that the problem was not solved. The burden of proof having been discharged in this way, there was no need for the respondent to produce additional data.

2.9 Therefore, the problem referred to by the appellant of providing a further binder with acceptable physical properties and improved applicability for scaling up cannot be considered to have been solved by the claimed lignin sulphonate alternative. The objective technical problem therefore must be formulated less ambitiously as the provision of another binder irrespective of its properties.

2.10 As a solution to this problem, the patent proposes the aqueous binder composition of claim 1 comprising a polycarboxy polymer and a poly alcohol characterised in that the binder properties are "deteriorated" by adding a water-soluble sulphonated lignin extender in an

extender-polycarboxy polymer weight ratio of at least 1:10.

- 2.10.1 D4 itself already discloses that adjuvants, such as fillers, may be added in an amount not exceeding about 20% of the weight of the binder (page 4, line 32 to page 5, line 2).

D4 thus already provides an incentive to look for fillers and thus extenders to add to the binder composition.

The skilled person looking for a specific filler/ extender would find D5, which, like D4, is in the field of binders for glass fibres (page 1, lines 10 to 12). From this document, he would learn that ammonium lignosulphonate (which is a sulphonated lignin) can be used as an extender for phenol formaldehyde binders (example 5 and page 1, lines 48 to 51 in conjunction with lines 81 to 83). It would thus have been obvious for the skilled person to use this extender in the binder of D4. By arbitrarily choosing an extender-polycarboxy polymer weight ratio of at least 1 to 10 out of the range disclosed in D4 (up to 20 wt% of the binder), the skilled person would arrive at the subject-matter of claim 1.

In fact, all that the skilled person needs to do is add a diluent (extender) to the composition of D4 to dilute, i.e. deteriorate, the effect obtained without diluent and to choose as a diluent the extender of D5. This is nothing more than common sense and thus obvious.

- 2.10.2 The appellant argued that D5 related to phenol-formaldehyde binders and the skilled person would not

take the teaching of D5 and transfer it to a different binder. The sulphonated lignin extender in fact reacted with the phenol formaldehyde binder in D5, since according to this document it shortened the setting time (page 1, lines 48 to 51). A straightforward switch to D4 was not possible since the chemistry was completely different.

However, whether the extender reacts with the binder or not and whether, when used in the binder of D4, it possibly deteriorates the binder properties is irrelevant, since the problem to be solved is just the provision of another binder, irrespective of its properties. The skilled person confronted with this problem would use the extender of D5 in the binder of D4 irrespective of whether he expected a deterioration of the binder properties.

- 2.10.3 The appellant furthermore argued that the sulphonated lignin in D5 was only disclosed in combination with urea and that there was no reason why the skilled person should extract the sulphonated lignin without urea and include it in the binder of D4. Using however a combination of urea and the sulphonated lignin would not lead to the subject-matter of claim 1, which excludes the presence of additional extenders.

The board does not agree with this argument. Ammonium lignosulphonate is disclosed on page 1, lines 48 to 50 of D5 as such, rather than in combination with urea, and accordingly it is ammonium lignosulphonate (Totanin[®]) alone that is used as an extender in example 5 of D5. Contrary to the appellant's assertion, the skilled person would thus learn from D5 that sulphonated lignin alone can be used as an extender.

2.11 The subject-matter of claim 1 is thus not inventive in view of D4 in combination with D5. The main request is therefore not allowable.

Second auxiliary request

3. Claim 1 of the second auxiliary request differs from claim 1 of the main request only in that the polysaccharide alternative (polysaccharides having a weight average molecular weight of not more than 10 000) has been deleted. Claim 1 of the second auxiliary request thus still contains the sulphonated lignin alternative of claim 1 of the main request. Hence, for the same reasons as given for claim 1 of the main request, claim 1 of the second auxiliary request lacks inventive step in view of D4 in combination with D5. Consequently, the second auxiliary request is not allowable.

Fourth auxiliary request

4. Admissibility

4.1 Claim 1 of the fourth auxiliary request differs from claim 1 of the main request in that it has been restricted to the polysaccharide alternative (polysaccharides having a weight average molecular weight of not more than 10 000), i.e. all other alternatives including the sulphonated lignin alternative have been deleted.

4.2 The respondent requested that the fourth auxiliary request not be admitted into the proceedings. This request diverged from the previous requests, which had all contained the sulphonated lignin alternative. The respondent could not foresee the restriction to the

polysaccharide alternative and thus the need to prepare for such a request.

The respondent's argument is not convincing. Apart from the fact that the polysaccharide alternative was already present in claim 1 of the main request filed with the statement of grounds of appeal, the board had announced in its preliminary opinion that the polysaccharide alternative would be discussed during the oral proceedings (point 2.2.2 of the preliminary opinion). Finally, in its submission of 22 February 2016, the appellant submitted D26, figure 3' of which relates to the polysaccharide alternative. Hence, the respondent should have been prepared to discuss this alternative.

Moreover, the respondent provided arguments on the polysaccharide alternative already in its response to the statement of grounds of appeal and thus should have been prepared to discuss this alternative. More specifically, albeit under the wrong heading "Auxiliary Request" (which did not contain the polysaccharide alternative), the respondent argued inventive step on the basis *inter alia* of figures 3 and 4 of the patent, which both relate to the polysaccharide alternative and in this context specifically referred to the polysaccharide extender "PAG+ 45 maltodextrin".

The board therefore decided to admit the fourth auxiliary request into the proceedings.

5. Inventive step

5.1 Both parties agreed that D1 could be considered to represent the closest prior art. Like the opposed patent, this document is directed to binder

compositions for the glass fibre industry (column 4, lines 53 to 57). It discloses a binder composition containing a polycarboxylated polymer and a polysaccharide having a weight average molecular weight of at least 10 000 (column 1, lines 54 to 61). D1 furthermore discloses that beneficial crosslinking effects can be obtained if a "small molecule polyol" is added to the polycarboxylated polymer and polysaccharide (column 3, lines 46 to 52). In particular, table 4b of D1 discloses a composition comprising

- polyacrylic acid,
- triethanol amine, and
- amioca, which is a polysaccharide, namely waxy corn starch, having a molecular weight of 64×10^6 (footnote of table 4b)

in a functional group ratio of 1.0/0.3/0.3.

Therefore, as already stated with regard to the main request, D1, and in particular the composition disclosed in table 4b of this document, can indeed be considered to represent the closest prior art.

- 5.1.1 Both parties agreed that the polyacrylic acid and triethanol amine in the composition of table 4b of D1 corresponded to the polycarboxy polymer and poly alcohol, and the functional group ratio to the extender-polycarboxy polymer weight ratio as required by claim 1.
- 5.1.2 Both parties also agreed that the composition of claim 1 differed from the composition of table 4b of D1

in terms of the weight average molecular weight of the polysaccharide.

- 5.1.3 It was however a matter of dispute whether the waxy corn starch in the composition of table 4b of D1 was water-soluble and thus whether the water-solubility required by claim 1 was an additional distinguishing feature.

During the opposition proceedings, the respondent had filed D2 to prove that the waxy corn starch in D1 was water-soluble. This document refers to "Westco Waxy Maize (Corn Starch Amylopectin)" (see the title and item: "1. Product Identifications") and states that it is slightly soluble in cold water and more soluble in hot water (heading "2. Physical Description/ Properties").

Also in its preliminary opinion (point 2.2.1), the board considered the water-solubility required by claim 1 not to be a distinguishing feature (according to the preliminary opinion, the composition of claim 1 differed from the composition of table 4b of D1 only in terms of the weight average molecular weight of the polysaccharide).

During the entire written appeal proceedings the appellant did not contest this. Only at the oral proceedings before the board did the appellant argue that D2 was not enough proof that the waxy corn starch of the composition of table 4b of D1 was water-soluble.

The board acknowledges that the burden of proof to show that the waxy corn starch in the composition of table 4b of D1 was water-soluble initially rested on the respondent. However, this burden of proof was

discharged by filing D2. It would therefore have been for the appellant to provide evidence that even though waxy corn starch was reported in D2 to be water-soluble, the specific one of table 4b of D1 was not. In the absence of any such proof, and in view of the fact that until the oral proceedings the appellant did not contest that the waxy corn starch of the composition of table 4b of D1 was water-soluble, the benefit of the doubt goes to the respondent. It must therefore be assumed in the respondent's favour that the waxy corn starch used in the composition of D1 (table 4b) is at least to some extent water-soluble. Without any definition as regards the degree of water-solubility in claim 1, the feature "water-soluble" in this claim therefore does not constitute a further distinguishing feature. The only distinguishing feature thus remains the weight average molecular weight of the polysaccharide.

- 5.2 It needs to be examined what problem is solved by this distinguishing feature.

The only example in the patent relating to the polysaccharide alternative of claim 1 is example 2. This example compares the comparative PAGplus binder composition of example 1, which apart from the polyacrylic acid and glycerol does not contain any polysaccharide, with a binder composition as claimed that in addition contains various amounts of the low molecular weight polysaccharide extender STAR-DRI[®]. As not disputed by the appellant, the comparative binder composition does not represent the teaching of the closest prior-art document D1, which already uses a polysaccharide. Therefore, example 2 cannot prove any unexpected technical effect over D1.

In the absence of any such proof, the problem solved in view of D1 is the provision of another binder composition, irrespective of its properties.

5.3 As a solution to this problem, the patent proposes the aqueous binder composition of claim 1 comprising a polycarboxy polymer, a poly alcohol having at least two hydroxyl groups and a water-soluble polysaccharide in an amount sufficient to establish an extender-polycarboxy polymer weight ratio of at least 1:10 characterised in that the polysaccharide has a weight average molecular weight of not more than 10 000.

5.4 The solution merely consists in the arbitrary variation of the molecular weight of the polysaccharide of the composition of table 4b of D1. In fact, a polysaccharide with a weight average molecular weight as claimed is already disclosed in D1 itself. More specifically, claim 1 of D1 discloses that the polysaccharide in this document has a weight average molecular weight of at least 10 000, which is the upper limit of the range defined in claim 1 of the fourth auxiliary request. Consequently, the skilled person finds the claimed solution in D1 itself.

The appellant argued in this respect that according to column 4, lines 29 to 31 of D1, small molecule saccharides exhibited a tendency to degrade and discolour at elevated temperatures. It followed furthermore from D1 that a low molecular weight of the polysaccharide led to a low tensile strength of the binder. D1 thus taught away from using a polysaccharide with a molecular weight as low as that required by claim 1 of the fourth auxiliary request.

However, D1 does not teach the skilled person not to use a polysaccharide with a weight average molecular weight of 10 000, as covered by claim 1 of the fourth auxiliary request. On the contrary, as set out above, the use of such a polysaccharide is explicitly disclosed in claim 1 of D1.

The subject-matter of claim 1 is thus obvious in view of the composition disclosed in table 4b of D1.

- 5.5 This finding would not change even if the water-solubility required by claim 1 were a further distinguishing feature. More specifically, the skilled person knows that water-soluble and water-insoluble starches exist. Therefore, the selection of a water-soluble starch as required by claim 1 represents an arbitrary selection of one of two possible alternatives. Such an arbitrary selection cannot contribute to inventive step.

The appellant argued in this respect that D1 taught away from using a soluble polysaccharide. More specifically, according to the bottom of column 5, greater water-insolubility resulted in an advantageous greater degree of crosslinking. The skilled person would thus be dissuaded by D1 from using a water-soluble polysaccharide.

The board does not agree with this argument. The appellant has not shown that the disadvantage of a lower degree of crosslinking is avoided by the claimed invention. Therefore, as set out above, the problem solved in view of D1 is simply the provision of another binder irrespective of its properties, rather than of a binder which avoids a low degree of crosslinking. Consequently, the skilled person just looking for

another binder and indifferent to its properties would not be discouraged by D1 from using a water-soluble polysaccharide.

5.6 The subject-matter of claim 1 is thus not inventive in view of D1. The fourth auxiliary request is therefore not allowable.

6. Admissibility of D26

With its letter dated 22 February 2016, the appellant filed D26. The respondent requested that D26 not be admitted into the proceedings.

The board did not however need to decide on the respondent's request not to admit D26. Figures 1 and 3 of D26 were not relied upon by the appellant in the above discussion of inventive step - the appellant rather relied on the corresponding figures in the patent. The remaining figure 3' relates to whether any problem is solved also for extender amounts as high as 95%, which was not relevant to the board's decision on inventive step.

Adjournment of the oral proceedings

7. The respondent requested that if the board admitted any of the first or third auxiliary requests or D26 into the proceedings, the oral proceedings be adjourned. Since the first and third auxiliary request were withdrawn and no decision on the admissibility of D26 was taken, the board did not need to decide on the request for adjournment of the oral proceedings.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



M. Cañueto Carbajo

W. Sieber

Decision electronically authenticated