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Datasheet for the decision of 7 October 2016

Case Number: T 0053/14 - 3.3.06

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Language of the proceedings: EN

Title of invention:

USE OF DISPERSIONS OF CROSSLINKED CATIONIC STARCH IN PAPERMAKING

Patent Proprietor:

Ecosynthetix Ltd.

Opponents:

1) Emsland-Stärke GmbH
2) Roquette Frères

Headword:

Crosslinked cationic starch / ECOSYNTHETIX

Relevant legal provisions:

EPC Art. 52(1), 54, 56, 83
RPBA Art. 12(4), 13(1), 13(3)

Keyword:
Novelty (no) - Main Request, Auxiliary Requests 1 and 2 - (yes) - Auxiliary Request 3
Inventive step - (yes) - Auxiliary Request 3
Sufficiency of disclosure - (yes)
Late-filed amendments to party's case - admitted (no)

Decisions cited:
T 0256/87, T 0608/07

Catchword:

Europäisches Patentamt
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Case Number: T 0053/14 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 7 October 2016

Appellant III: (Patent Proprietor)	Ecosynthetix Ltd. 3900 Collins Road, Suite 1018 Lansing MI 48910 (US)
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Appellant II: (Opponent 02)	Roquette Frères 62136 Lestrem (FR)
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Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 14 November 2013 concerning maintenance of the European Patent No. 1 303 667 in amended form.**

Composition of the Board:

Chairman	B. Czech
Members:	G. Santavicca
	C. Heath

Summary of Facts and Submissions

I. The appeals by Opponents 1 and 2 (Appellants I and II) and by the Patent Proprietor (Appellant III) lie from the interlocutory decision of the Opposition Division concerning maintenance of European Patent No. 1 303 667 in the amended form according to the then pending Third Auxiliary Request.

II. The independent claims of said Third Auxiliary Request read as follows (features added to the corresponding independent claims of the patent as granted highlighted by the Board):

"*1. Use of a starch dispersion comprising discrete particles of crosslinked cationic starch in an aqueous liquid in papermaking, wherein the starch dispersion is used as a an additive in the papermaking stock and the particle size of the starch particles in the starch dispersion ranges from 200 nm to 100 µm,* ***and wherein the starch dispersion is obtained by a process comprising***
a) processing a mixture of cationic starch and an aqueous liquid using shear forces in an extruder and simultaneously crosslinking, or
b) extruding a mixture of crosslinked cationic starch and an aqueous liquid in the presence of a hydroxylic liquid to form the dispersion."

"5*. A composition comprising pulp, a filler and an aqueous dispersion of discrete particles of crosslinked cationic starch, wherein the starch particles in the starch dispersion ranges from 200 nm to 100 µm,* ***and wherein the starch dispersion is obtained by a process comprising***
a) processing a mixture of cationic starch and an

aqueous liquid using shear forces in an extruder and simultaneously crosslinking, or
b) extruding a mixture of crosslinked cationic starch and an aqueous liquid in the presence of a hydroxylic liquid to form the dispersion."

"*6. A method of preparing a dispersion of cationic starch particles in an aqueous liquid comprising:*
(a) obtaining a mixture of cationic starch and an aqueous liquid;
(b) processing the mixture using shear forces ***in an extruder*** *in the presence of a crosslinker; and*
(c) adding and mixing in a hydroxylic liquid to obtain the starch dispersion."

"*11. A dispersion of cationic starch particles obtainable by the method according to any of claims 6 to 10.*"

"*12. Use according to any of claims 1 to 4 wherein the starch dispersion is obtainable by the process according to any of claims 6 to 10.*"

Claims 2 to 4 and 7 to 10 are directed to more specific uses and methods according to Claims 1 and 6, respectively.

III. Two oppositions were filed against the patent, on the grounds of Article 100(a),(b) and (c) EPC.
The items of evidence relied upon *inter alia* include the following documents:

C1: GB 1 420 392 B;
C20: WO 97/46591 A1;
C26: Mastersizer 2000, Printout from the website www.malvern.com

C27: Mastersizer 2000, Operator's guide, 1999;
C28: Declaration by Dr Michael F Cunningham, dated 22 August 2013; and
C29: Experimental Report by Steven Bloembergen, dated 22 August 2013.

IV. In the decision under appeal, the Opposition Division came to (*inter alia)* the following conclusions:
- The claimed invention was sufficiently disclosed.
- The subject-matter of *inter alia* method Claim 6 according to the then pending Second Auxiliary Request (identical to Claim 6 as granted, and to Claim 6 according to the First Auxiliary Request) lacked novelty over C20.
- The subject-matter of the claims according to the Third Auxiliary Request was novel over the cited prior art and also inventive taking either of C20 and C1 as the closest prior art.

V. In its statement setting out the grounds of appeal dated 4 March 2014, the Patent Proprietor (Appellant III) defended the patent as granted (Main Request), and in the amended versions with the claims according to the First and Second Auxiliary Requests that had already been pending before the Opposition Division.

VI. With its statement setting out the grounds of appeal, Opponent 01 (Appellant I) submitted a further document:

C40: J.J.Houet, B.Do et al, *L'Analyse granulométrique, ses caractéristiques, son intérêt dans l'industrie pharmaceutique*, STP Pharma Pratiques 12(4), 196-204, 2002,

supposed to illustrate common general knowledge at the priority date of the patent in suit and to support its

insufficiency objection. It also maintained that the claimed subject-matter lacked novelty, or at least did not involve an inventive step, in view of C1 or of C20. It also argued that there had been a breach of its right to be heard (Article 113(1) EPC) during the oral proceedings before the Opposition Division.

VII. With its statement setting out the grounds of appeal, Opponent 02 (Appellant II) also submitted further documents, *inter alia*:

C34: Linfu Wang et al, *Preparation of Starch Succinates by Reactive Extrusion*, starch/Stärke, 49 (1997) Nr.3, pages 116-120;
C35: W. Narkrugsa et al, *Herstellung von Stärkederivaten durch Heißextrusion*, starch/ Stärke 44 (1992) Nr. 3, pages 81-90;
C36: O.B. Wurzburg, *Modified Starches: Properties and Uses*, 1986, Chapter 3, pages 42-53;
C37: O.B. Wurzburg, *Modified Starches: Properties and Uses*, 1986, Chapter 8, pages 113-129;
C38: R.L. Shogren, *Starch: Properties and Materials Applications*, Biopolymers from Renewable Resources, 1998, Springer, pages 30-46;
C41: ASTM D 4464-00, Standard Test Method for Particle Size Distribution of Catalytic Material by Laser Light Scattering; and
C42: Supplemental Experimental Report.

It maintained that the claimed subject-matter was insufficiently disclosed, and that the subject-matter of all claim requests was not new over C20, or at least not inventive in the light of C20.

VIII. With its statement setting out its grounds for appeal (letter dated 17 July 2014), the Patent Proprietor

(Appellant III) submitted Auxiliary claim Requests 3 to 8. The Patent Proprietor rebutted all pending objections, referring also to further items of evidence including:

C44: Renliang Xu, *Particle Characterization: Light Scattering Methods*, Chapter 3, Kluwer Academic Publishers, 2000, Pages 3-74;

C45: J.M.Swinkels, *Sources of Starch, its Chemistry and Physics*, Starch Conversion Technology, Food Science and Technology, 1985, Marcel Dekker, Inc, pages 15-46;

C46: M.W.Kearsley & S.Z.Dziedzic, *The technology of Starch Production*, Handbook of Starch Hydrolysis, Products and Derivatives, 1995, pages 1-25;

C47: J.M.V. Blanshard, *Starch Granule Structure and Function: a Physicochemical Approach*, from T. galliard, Starch: Properties and Potential, 1987, pages 16-54;

C48: R.C.W. Weast, Handbook of Chemistry and Physics, CRC Press, 54th edition, 1973-1974, page C-74, C-291.

IX. In a further letter dated 7 August 2014, Opponent 01 (Appellant I) requested *inter alia* that the case be remitted to the Opposition Division, because its right to be heard had been breached, in so far the decision under appeal did not consider relevant arguments and evidence submitted by the opponents, and was, thus, not reasoned.

X. In a communication issued in preparation for the oral proceedings, the Board *inter alia* gave its provisional opinion on some salient issues of the case.

XI. In reaction thereto, the Patent Proprietor re-filed the

set of claims held allowable by the Opposition Division as its new Auxiliary Request 3 (see Point II, *supra*).

XII. Oral proceedings were held on 7 October 2016.

Opponent 1 submitted a printout from www.chemie.de :

C51: P. Kippax, *Messung von Partikelgrößen mittels moderner Laserbeugungstechniken*, © 1997-2016, CHEMIE.DE Information service GmbH, pages 1-4.

After an indication by the Board that it considered C20 to be novelty destroying against Claim 6 of the Main Request, the Patent Proprietor stated that it had no further arguments regarding novelty over C20 for the respective Claim 6 of Auxiliary Requests 1 and 2. The parties were inter alia heard on the following issues:

- Admissibility of the amendment to opponents' case in the context of Claim 6, concerning the question raised during the oral proceedings of whether applying shear forces in an extruder necessarily led to starch granule fragmentation, as well as whether C20 (page 6, penultimate paragraph) dealt with starch granule bursting.

- Admissibility of a new attack by Opponent 2 against inventive step, based on C20 or C1 in combination with document C35 ("Herstellung von Stärkederivaten durch Heißextrusion"), filed in appeal proceedings.

- Admissibility of further novelty objections by Opponent 1 against Claim 11, contested by the Patent Proprietor.

- Admissibility of a further objection by Opponent 1

against Claim 6 based on Article 123(3) EPC, admittedly never raised before.

XIII. Final requests

Appellants I and II (**Opponents** 1 and 2) requested that the decision under appeal be set aside and that the patent be revoked.

Appellant III (**Patent Proprietor**) requested that the decision under appeal be set aside and that the patent be maintained as granted (Main Request) or, in the alternative, on the basis of the claims according to one of Auxiliary Requests 1 and 2 filed with letter dated 17 July 2014, or that the appeals by the opponents be dismissed (Third Auxiliary Request), or, that the decision under appeal be set aside and that the patent be maintained on the basis of the claims according to one of Auxiliary Requests 4 to 8, all filed with letter dated 17 July 2014.

XIV. The arguments of the **Opponents** of relevance for the present decision can be summarised as follows:

Main Request and Auxiliary Requests 1 and 2

The subject-matter of Claim 6 according to these three claim requests lacked novelty over the preparation method disclosed in Example C of C20 which comprised the steps of providing a mixture of starch and water, cationising the starch; crosslinking the cationised starch under stirring, hence under shear forces, dispersing the crosslinked, cationised starch in water, in the same way as shown in Example A, so that a dispersion of swollen, but reticulated, cationised starch particles was obtained.

Auxiliary Request 3 - Procedural violations

The right to be heard had not been respected to the extent that the decision under appeal did not address important arguments of Opponent 1 regarding its insufficiency objection. These arguments submitted during the oral proceedings were relevant also as regards the claim request held allowable. They concerned the allegedly incorrect reproduction of the examples of C1 and of the patent in suit in C29, and the lack of relevance of C28 as regards the particulars of the measuring method which were lacking in the patent in suit.

Also, the decision under appeal went against the principle *ne bis in idem* in so far a negative decision on sufficiency of disclosure had already been taken in a parallel case involving the same parties, dealing with the same issue of particle size measurements, so that this issue should not have been decided again, let alone differently.

Third Auxiliary Request - Admittance of amendments to Opponents' cases

Document C51 filed at the oral proceedings was rather new but was an abstract on the Mastersizer apparatus referred to by the Proprietors, which had been found the day before the oral proceedings when reviewing the issue of whether it was sufficiently disclosed how to determine whether a dispersion was within or outside the claimed range of particle size. C51 further corroborate the view that the patent did not sufficiently disclose all the necessary details for the determination of the particle size. Thus, it should be admitted into the proceedings and considered.

Document C35 was filed with the statement setting out the grounds of appeal of Opponent 2, in reaction to the development of the opposition procedure leading to the decision under appeal (e.g. page 14, fourth paragraph). Even if C35 were not considered to illustrate common general knowledge, it nevertheless evidenced that crosslinking of cationic starch within an extruder was known since 1992. Hence, C35 was *prima facie* highly relevant.

As regards the novelty objection against Claim 11, attention had to be paid to the fact that the dispersion of Claim 11 was defined as a product-by-process, and could thus be made by other processes than the ones expressly referred to in the claim. As the process features of Claim 11 could be disregarded, any known cationic crosslinked starch dispersion took away the novelty of the dispersion of Claim 11.
C1 *inter alia* disclosed (page 2, lines 125 to 128, were referred to) the use of starch derivatives, which included cationic starches. Thus, the subject-matter of Claim 11 lacked novelty over C1. This objection, albeit raised only at the oral proceedings, should be admitted, as the issue of novelty had only been dealt with in a general manner before the Opposition Division, without entering into details. Once novelty of the subject-matter of Claim 1 had been acknowledged, all other claimed subject-matters had simply been considered to be new, too.
Under Point 4.1.1 of the statement of grounds of Opponent 2 it was merely acknowledged that the skilled person knew how to disrupt the starch granules, not however that the alleged fragmentation of granules in an extruder was always achieved. Hence, concerning the process of Claim 6 and the dispersion of Claim 11, the fact that in C20 starch had not been crosslinked in an

extruder did not automatically result in a different dispersion. The dispersion resulting from the process of C20 was also made of particulate starch. C38 was evidence in this respect. There were no comparative tests in the patent showing the presence or the desired amount of starch fragments in the composition as claimed. Indeed, the patent in suit as granted did not mention that there was a difference between the process of granted Claim 6, which did not mention an extruder, and the process of present Claim 6, using an extruder. This also applied to the respective compositions obtained thereby, namely the composition of Claim 11 obtained from the process of Claim 6. Thus, the subject-matter of Claim 11, i.e. the dispersion obtainable by the method of Claim 6, also lacked novelty over Example C of C20. This was not a new objection, but the result of the interpretation of the feature "*shear forces in an extruder*", which did not necessarily provide a shear sufficient to disrupt the starch granules.

At the oral proceedings, Claim 6 according to Auxiliary Request 3 was also objected to under Article 123(3) EPC, as the patent as granted comprised no claim directed to a process requiring the application of shear forces in an extruder.

The claimed subject-matter (all claims) was also obvious over C20 or C1, taken as the closest prior art, in combination with C35 (in particular, last sentence of Point 3 thereof). The technical problem stated in the patent in suit was not solved across the whole breadth of the claims. Even if the unclear feature "*discrete particles*" and their size range as defined in Claim 1 held allowable by the Opposition Division were considered, it was already known to use reticulated

cationic starches in the papermaking. C35 explicitly hinted at crosslinking cationic starch within an extruder, because the crosslinking in an extruder led to a product which was easily dispersable in water, which thus did not require any heating step before use. The claimed subject-matter was thus obvious.

Third Auxiliary Request - Lack of inventive step

The process defined in Claim 6, and the dispersion of Claim 11, were the broadest subject-matter claimed according to Auxiliary Request 3, as they were neither restricted to any particle size range nor to any particular use thereof.

C1 (e.g. Example 1) was the closest prior art. C1 disclosed a process in which starch was crosslinked under shear forces and then extruded. The person skilled in the art knew that the ether/ester starch derivatives mentioned in C1 (page 2, lines 125-128) included cationic starches, as well as that cationic starches were used in papermaking. C1 envisaged "sizing of paper" as one application of the crosslinked starches (mentioned as such also on page 2, line 84), disclosed that its starches could be generally used as adhesives (Claims 9 and 6 were referred to) and mentioned all possible uses of the starches in a non-exhaustive list. The problem solved in the light of C1 was the mere providing of an alternative, which as such was obvious over C1 alone, as the skilled person would want to use the starches disclosed therein in dispersions for papermaking, too.
C20 could also be taken as the closest prior art. It disclosed all of the features of Claim 6 but the extrusion. It was known that heating and appropriate shear forces were necessary to achieve the sought-for

fragmentation of starch granules. The invention as described in the patent in suit also involved a heating step, albeit in the extruder. In fact, Claim 7 as granted foresaw the possibility of dispersing within the extruder, hence under heating, without any limitation of the temperature thereof. Thus, the alleged omission of a heating step in Claim 6 could not be invoked as a difference over C20 amounting to an improvement. Comparative tests C29 related to C1. No comparative tests over C20 were available. Thus, no effect whatsoever over C20 had been proven.
The problem solved was the provision of an alternative dispersion of cationic starch with controlled cross-linking and of low viscosity.

The skilled person starting from C20 was aware of the advantages associated with the use of an extruder (the dispersions of C1 were produced in that way) and would have wanted to use an extruder not only as replacement for a stirring device, but also for quickly and constantly producing less viscous starch dispersions, which might be dispersed in cold water (page 1, lines 80 ff, of C1 was referred to).

Thus, the dispersion of Claim 11 was obvious over C20 and C1.

Third Auxiliary Request - Insufficiency of disclosure

Claim 1 of Auxiliary Request 3 defined the starch particle in the dispersion by a particle size range, without clarifying whether the term "*discrete particle*" referred to starch particles in the form of e.g. granules or fragments thereof. Moreover, the method by which it should be determined was not mentioned. The measure of the particle size defined in the claims was

not possible, as relevant particulars of the measurement method to be used were missing in the patent in suit.

The description of the patent in suit mentioned laser light scattering without, however, disclosing the necessary particulars, as apparent *inter alia* from C28. More particularly, the patent did not mention any suitable measuring instrument, or the dispersant to be used, the refraction index of the starch particles in the dispersion to be considered; the concentration of the dispersion analysed; the basics to be applied for the measure.

Thus, the patent in suit did not disclose any of the items of information considered relevant in C28.

The invention as defined in method of Claim 6 was insufficiently disclosed, since this method did not require stirring and heating steps.

Thus, the person skilled in the art without undue burden could neither reproduce the invention nor establish with certainty if he/she was working within the ambit of the claims in terms of the starch particle size range.

According to established case law, if the skilled person did not know whether he was working inside the claim's scope, the requirements of Articles 84 and 83 EPC were not fulfilled.

The claimed subject-matter was thus insufficiently disclosed.

In support of their objections regarding the alleged

insufficiency, the opponents also made reference to late filed documents
- C34, C40 and C41, allegedly proving that a multiplicity of measuring methods existed for measuring particles which did not lead to the same result, and that the particulars for using these methods should have been disclosed,
- C51, allegedly teaching that depending on the model used (Fraunhofer or Mie) the result could be faulty, and that the use of the Mie model required the knowledge of the refraction index of the starch particles in the dispersion, not disclosed in the patent in suit, and
- C42, allegedly disclosing steps which were necessary to prepare the claimed dispersion, which had not been disclosed.
However, as these late filed documents were not admitted into the proceedings (*infra*), the arguments respectively based thereon are of no relevance for the present decision.

XV. The arguments of the **Patent Proprietor** of relevance for the present decision can be summarised as follows:

Main Request and Auxiliary Requests 1 and 2 - Novelty

Example C of C20 did not disclose a method with all the features of Claim 6. In particular, the "*shear forces*" referred to in Claim 6 had to be such as to disrupt the starch particles, whilst the forces applied according to C20 merely had to be sufficient to agitate the mixture. Thus, the claimed subject-matter was novel.

Non-admittance of amendments to Opponents' cases

Document C51 had been filed at the oral proceedings

before the Board, hence too late. Moreover, the document was not relevant, at least not more than C28, and did not prove that the claimed invention could not be carried out. Thus, C51 should not be admitted into the proceedings.

Documents C34 to C41 should not be admitted either, because they could have been filed earlier. C40 was moreover post-published and could thus not establish common general knowledge at the priority date of the patent in suit.

At the oral proceedings before the Opposition Division, the opponents had not pursued any novelty objection against the subject-matter of Claim 11 according to Auxiliary Request 3, although the feature "*shear forces*" had been extensively discussed, as acknowledged in the decision under appeal (reasons, 9). Hence, also the objection raised before the Board was raised too late and generated new complex issues.
Also, during the opposition proceedings, it had been shown by e.g. C29 that the claimed composition was different from that of C1. In its statement setting out the grounds of appeal (Point 4.1.1), Opponent 02 had conceded a difference in structure. Thus, no new novelty objection on this basis should be admitted into the appeal proceedings.

The new argument of the opponents that the patent in suit made no difference between a process with an extruder and processes without an extruder (as according to C20) should not be endorsed for the following reasons: The fact that the method of Claim 6 was broader than the methods using an extruder illustrated in the patent did not mean that it dealt with processes applying any shear forces. Concerning

the alleged dispersion under heating in the extruder, no extruder was disclosed in C20, which instead disclosed the extra step of heating for dispersing; the examples of the patent in suit used no such extra-step of heating.

Also the fact that Claim 11 was drawn up as product-by-process claim implied that the properties of the dispersion were derived from the process by which it was made. Thus, the argument that the process part (features) of the claim was not clear, not limiting, and could be disregarded, was not convincing. Something that had not not been made in an extruder could not have any of the properties obtainable only thereby. The new objections raised against the novelty of Claim 11 on the basis of C20 according to Auxiliary Request 3 at the oral proceedings were thus not admissible, either.

The new inventive step objection on the basis of a combination of C20 or C1 with C35, raised for the first time at the oral proceedings before the Board, should not be admitted, either. Although C35 had been submitted with the statement setting out the grounds of appeal of Opponent 2, only general references to some passages were given, in relation to the statement in Point 4.1.1 thereof, i.e. that it was known to crosslink a cationic starch in an extruder. Two of these passages were mentioned again during the oral proceedings. However, no objections whatsoever on the basis of C20 or C1 and C35 had been raised, let alone substantiated, in the statement. Even if C35 and the new objection based thereon were admitted, it could not succeed, as C35 did not disclose crosslinking of starch in an extruder.

The objection under Article 123(3) EPC against Claim 6

raised at the oral proceedings was extremely late, surprising and appeared unfounded. It should thus not be admitted.

Third Auxiliary Request - Novelty

The dispersion of discrete, cross-linked particles of cationic starch according to the present invention was a new product, different from prior art starch dispersions. The new dispersion was the result of processing starch under shear forces and simultaneously cross-linking it in an extruder. The starch particles so obtained could be dissolved without requiring a dissolution step under heating, before being applied in the papermaking. The discrete particles formed under the influence of mechanical forces were devoid of the original granular morphology, as the shear forces in the extruder lead to the rupturing of the starch granules. None of the invoked prior art documents taught the making of dispersions of the discrete particles of crosslinked cationic starch as claimed. C20 taught instead that the application of shear forces was a problem. C1 did not even disclose any cationic starches. Thus, the claimed subject-matter was novel.

Third Auxiliary Request - Inventive step

The patent in suit dealt with the treatment of the paper making stock, in particular wet end additives thereof. These served to prevent any loss of material and good properties, i.e. to achieve paper strength, an important property, as acknowledged in the patent in suit (paragraph [0014] was referred to). In this respect, processability should not be impaired, e.g. by heating steps, as required by C1 (page 4, lines 1-5, and all of the examples were referred to).

The application of the starch dispersion according to the patent in suit was thus quite different from that of C1, dealing with other types of starch, to be used in other applications, such as pigment coating of paper.

C1 did not deal with wet end additives for paper making stocks. It mentioned "internal sizing" but as part of the background art. It did not disclose the use of cationic starches in the wet end treatment of paper making stocks. Claim 9 of C1 dealt with film-forming adhesives, not with wet end additives. C1 did thus not address the same goal, the same purpose, or the same problem, as the patent in suit, and thus could not qualify as the closest prior art. The opponents wanted to use it simply due to the high congruence with the features of the claim. This approach was, however, not in accordance with the case law.

C20 was a more appropriate starting point in the case at issue. However, this document did not teach the use of an extruder. Indeed, the process of C20 (page 6) tried to avoid bursting of the starch granule, and always required a heating step for dispersing the cationic crosslinked starch (Example A, lines 26-28). Contrary to C20, the process claimed in the patent in suit aimed at solving the heating problem (paragraph [0003]), whilst keeping the good properties of paper (paragraph [0014]), and provided a process which successfully did not require a heating step for dispersion (paragraph [0037]). The claimed process thus produced cationic, crosslinked, extruded starch, which was more soluble in cold water, as shown by the examples of the patent in suit. None of the prior art documents invoked by the opponents suggested to cross-link cationic starch granules and apply shear forces in

an extruder. Thus, the claimed subject-matter of Auxiliary Request 3 was not obvious.

Third Auxiliary Request - Sufficiency of disclosure

The term "*discrete particle*" used in the claims at issue was clear and referred to the crosslinked particles formed under application of shear forces in an extruder, as extrusion was also mentioned in both alternatives a) and b) of Claims 1 and 5.

It was common in the field of starches to indicate particle sizes without specifying the method for determining it, as evidenced by e.g. C45, C46 and C47.

As regards the determination of the particle size, it had been established by C28 that particle size determination by laser light scattering was a well known technique in 2000 which had replaced conventional methods. The new technique was reliable and easy to use, thus fast, and also standardized, as apparent even from C41, for the two main mathematical models.

Still according to C28 there were at least two appropriate instruments available in 2000, and there was no reason to suppose that their use led to different results, as this had not been shown by the opponents. The alleged lack of particulars, such as solvent and refraction index was not a problem, either: the refractive index was a simple, known or measurable parameter for most of the solvents. C27, the operating manual, mentioned how the samples had to be prepared and how some refractive indices could be found, whereby C48 also disclosed those of uncommon dispersants. Additionally, it was known that particle size of starch dispersion could be measured in water (C49), which

according to C27 was the most logical dispersant to use. Thus, the lack, in the patent in suit, of indications of some particulars of the method of measure had not been proven to amount to an insufficiency of the disclosure. As to the concentration of the sample, it could not be indicated, as it was the result of the measurement, and C27 taught that samples with precise concentrations were not necessary. Furthermore, what was reported as particle size was the averaged result of all the particles based on the equivalent spheres model, the only feasible option for commercial machines (C44).

Thus, in line with recent case law, if commercial methods for determining a parameter defined in a claim led to different values, this was a matter for Article 84 EPC. It was the same with the use of different mathematical models. Even if two models did not give exactly the same results, this would not prevent the skilled person from ascertaining whether he was working inside the claim.

Finally, the rework of Example A of the patent carried out by Opponent 2 (C42) did not mention all the detailed conditions, contrary to Example A, so that it was not possible to establish what had gone wrong . Thus, this rework was no evidence of an insufficient disclosure. Consequently, late filed experimental report C42 was not admissible.

The claimed invention was sufficiently disclosed.

Reasons for the Decision

Main Request and Auxiliary Requests 1 and 2 - lack of novelty - method Claim 6

1. Claim 6 of the patent as granted, Claim 6 of Auxiliary Request 1 and Claim 6 of Auxiliary Request 2 are identical and differ from Claim 6 as considered allowable by the Opposition Division in that step (c) of the former does **not** need to be carried out in an extruder (see Point II, *supra)*.

2. Prior art method - document C20

2.1 C20 (Example C) discloses a method of preparing a dispersion of cationic starch particles in an aqueous liquid, comprising the following steps:
(i) slurrying wheat starch in water and reacting it with a quaternary ammonium compound (steps (i) to (v) of Example C),
(ii) adding a crosslinker (STMP) to the mixture and crosslinking under stirring (steps (vii) to (viii) of Example C),
(iii) filtering, washing and drying the starch (step (x) of Example C); and
(iv) swelling the modified starch so prepared at 70°C at 3.0% solids in a similar manner to the starches prepared in Example A of C20 (see last two lines of page 10 of C20 in combination with lines 26 to 28 of page 8 of C20), i.e. by re-slurring the starch in water.

2.2 Step (i) identified above amounts to "*obtaining a mixture of cationic starch and an aqueous liquid*" as required by step (a) of Claim 6 at issue.

Step (ii) identified above amounts to "*processing the mixture using shear forces in the presence of a crosslinker*", since stirring necessarily involves "*using shear forces*" within the broadest meaning of this expression (shear forces not quantified in the claim). The Board sees no compelling reason for adopting a narrower meaning of the claimed expression "*using shear forces*" in the sense of shear achieved in extrusion but not in conventional stirring. In particular, a disruption of the starch particles being processed is not required by Claim 6 at issue.

The occurrence of step (iii) as identified is not excluded, and hence encompassed, by Claim 6 at issue (using the open term "*comprising*"). Moreover, the patent even expressly addresses the possibility of intercalating a step of drying and grinding between the steps of crosslinking under shear forces and adding and mixing a hydroxylic liquid in preparing the dispersion: For instance according to Example A (paragraph [0034], line 14) "*[t]he extrudate was dried and cryogenically ground and then dispersed in water*".

Such re-dispersion in water, identified as step (iv), *supra*, amounts to "*adding and mixing in a hydroxylic liquid to obtain the starch dispersion*" as required by step (c) of Claim 6 at issue.

2.3 Thus, in the Board's judgement, C20 directly and unambiguously discloses a method with all the features of Claim 6 at issue. Its subject-matter thus lacks novelty over C20 (Article 54(1)(2) EPC).

2.4 Hence, none of the Main Request and Auxiliary Requests 1 and 2 is allowable.

Non-admittance of amendments to the Opponents' cases

3. Newly filed items of evidence

3.1 In its communication issued in preparation for the oral proceedings, the Board had indicated that it was inclined to admit into the proceedings those amongst the newly filed documents which illustrated common general knowledge (including, *inter alia*, C36 and C44 to C48).

This was not contested, so that documents C36 and C44 to C48, of relevance to the present decision, were admitted into the proceedings despite their late filing (Article 114(2) EPC and Article 12(4) RPBA.

3.2 Documents C34, C35, C40 and C42 are not dealt with in the decision under appeal, do not illustrate common general knowledge, relate to the production of starch derivatives (not cationic starch; C34 and C35) in an extruder, are post-published (C40), and their admissibility into the proceedings was contested by the Patent Proprietor in view of their late filing and *prima facie* lack of relevance (experimental report C42).

Therefore, the Board decided not to admit documents C34, C35, C40 and C42 into the proceedings and to disregard objections and arguments based thereon (Article 114(2) EPC and Articles 12(4) RPBA).

3.3 Opponent 1 only filed document C51 at the oral proceedings, indicating that this document had only been found the day before.

The Board does not consider this to be a convincing

justification for the very late filing of C51.

Thus, the Board decided not admit C51 into the proceedings and to disregard the arguments based thereon (Article 114(2) EPC and Articles 12(4), 13(1) (3) RPBA).

4. New patentability objections raised in the appeal proceedings

4.1 New novelty objection against Claim 11

4.1.1 As regards the objections of lack of novelty over C1 or C20 raised by the opponents against the subject-matter of product-by-process Claim 11 (wording under II, *supra*) at the oral proceedings before the Board, the following is noted:
- It is apparent from the minutes of the oral proceedings before the Opposition Division (see Point 7.3 thereof) that the opponents did not raise any objections of lack of novelty against the claims of the (then) (new) Third Auxiliary Request.
- The raising of these new objections thus amounts to amendments to the opponents' case which were sought to be made for the first time during the oral proceedings before the Board.
- The late raising of the objections and their merit were contested by the Patent Proprietor.

4.1.2 The Board holds that said novelty objections could and should have been raised earlier in the opposition or appeal proceedings. Moreover, if admitted, further issues of a non-trivial nature (implications of the feature "*extruding*" - e.g. the extent of fragmenting the starch granules - on the properties of the product claimed) which the Board and the Patent cannot

reasonably be expected to deal with for the first time at this late stage of the oral proceedings,

4.1.3 Hence, in the exercise of its discretion under (Article 114(2) EPC and Articles 12(4) and 13(3) RPBA), the Board decided not to admit and consider these new objections.

5. New inventive step objections

5.1 At the oral proceedings, Opponent 2 for the first time raised inventive step objections based on a combination of C1 or C20 taken as the closest prior art in combination with C35.

5.2 In this respect, the Board observes the following:
- C35 was filed with the statement of grounds of appeal of Opponent 2 as evidence of common general knowledge on the extrusion of starch.
- Since this document was already on file before, the new objection could and should have been raised before the day of the oral proceedings.
- The objection raised thus surprised the Board and the patent Proprietor, raising questions not dealt with before.
- The Patent Proprietor requested the non-admittance of this objection.

5.3 Taking into account the above aspects, the Board, in the exercise of its discretion under Article 114(2) EPC and Articles 12(4) and 13(3) RPBA, decided not to admit this new objection into the proceedings.

6. New objection under Article 123(3) EPC

6.1 An objection under Article 123(3) EPC against Claim 6

of Auxiliary Request 3 was also raised for the very first time at the oral proceedings before the Board.

6.2 No proper justification was provided in this respect. Moreover, this new objection appears to be *prima facie* unfounded, as Claim 6 according to Auxiliary Request 3 (Point II, *supra*) is of the same category and incorporates an additional limiting feature ("*in an extruder*").

6.3 Taking into account the above aspects, the Board, in the exercise of its discretion, decided not to admit this new objection into the proceedings (Article 114(2) EPC and Articles 12(4) and 13(3)RPBA).

Third Auxiliary Request – construction of Claims 1 and 5

7. The opponents have *inter alia* objected that no passage of the description specifically describes what should be understood by the term "*discrete particles*".

7.1 For the Board, the feature "*discrete particles of crosslinked cationic starch*" comprises only conventional terms which already per se (e.g. discrete particles) unambiguously convey to the skilled reader the technical teaching of separate entities in particulate form, made up of starch, the molecules of which are to a certain extent cross-linked and the hydroxyl groups of which are (partly) cationised".

7.2 It was generally known (e.g. C36, page 49, Point F.) that starch granules, depending on whether they are crosslinked, cooked, or simply swollen are more or less sensitive to shear conditions.

7.3 Claims 1, 5, 6 and 11 of Auxiliary Request 3 all

require that the starch dispersion referred to is prepared by a process including a step involving the use of shear forces applied "*in an extruder*" / in "*extruding*".

7.4 Thus, in the context of claims 1 and 5 the feature "*discrete particles*" must be construed as reflecting the effects of carrying out the claimed process "*in an extruder*".

For the Board, considering the information content of the patent in suit, the disclosure of C1 (fragmentation of crosslinked starch granules in an extruder) and common general knowledge as illustrated by e.g. C36 (Point F, page 49), it is plausible that subjecting starch granules (crosslinked or not yet crosslinked) in an aqueous mixture to shear forces in an extruder implies that granules will be disrupted into discrete fragments.

7.5 It follows from the foregoing that the skilled person reading Claims 1 and 5 understands that the term "*discrete particles of crosslinked cationic starch*" encompasses crosslinked cationic starch granules and fragments thereof, having a size falling within the range defined in Claim 1.

7.6 The following assessment of novelty and inventive step is based on this interpretation.

Third Auxiliary Request - Novelty

8. The admitted novelty objections maintained were based on C20 and C1, respectively.

8.1 The Board is, however, satisfied that the claimed

subject-matter is novel over each of C20 and C1 for the following reasons.

8.2 Novelty over document C20

8.2.1 C20 does not disclose the use of an extruder in the described method for the preparation of starch dispersions. Instead, it directly and unambiguously discloses that the granule size is to be controlled by the selection of the starch(blend) starting material and the degree of crosslinking (e.g. page 8, lines 7 to 8 and 13 to 14), in particular in order to avoid overswelling or (even) bursting during the (subsequent) cooking (e.g. page 6, lines 30-32).
In other words, C20 teaches that the starch dispersions prepared should contain "disperse swollen, crosslinked and cationised granules of starch", but not fragments thereof.

8.2.2 C20 does not require the use of an extruder, whilst the requirement "*processing by shear forces in an extruder*" (Claim 6), "*processing a mixture of cationic starch and an aqueous liquid using shear forces in an extruder and simultaneously crosslinking*" (Claims 1 and 5; alternative a)), "*extruding a mixture of crosslinked cationic starch and ...*" (Claims 1 and 5, alternative b)) imply that the starch dispersion referred to must comprise fragments of the starch granules.

Hence, in the Board's judgement, novelty over C20 must be acknowledged for all the subject-matter as claimed.

8.3 Novelty over document C1

8.3.1 C1 (claim 1, page 2, left column, line 9, to right column, line 74) discloses an aqueous, film-forming and

non-migrating adhesive consisting of an aqueous starch suspension obtained by extruding and milling previously crosslinked starch granules. The weight average particle size of the dispersed (swollen) fragmented starch is from 1 to 10 micrometres, with less than 15% of the granules fragments are larger than 10 micrometres.

8.3.2 However, C1 only generally mentions "ether or ester derivatives" of starch as alternatives to natural starches (page 2, line 127 of C1). This expression encompasses all kinds of ether and ester starch derivatives without, however, directly and unambiguously disclosing any particular derivative, let alone cationic starch.

8.3.3 At least for this reason, C1 is not novelty destroying for the subject-matter of the claims at issue.

8.4 Thus, neither C20 nor C1 is novelty destroying for the subject-matter of any of independent Claims 1, 5, 6 and 11 and the claims dependent thereon (Article 52(1) and 54 EPC).

Third Auxiliary Request - Inventive step

9. The invention

9.1 The invention concerns dispersions of crosslinked cationic starch particles (Claims 11), their use in papermaking (Claim 1 and 12), a process for their preparation (Claim 6) and the dispersions (Claim 11) obtainable by that process, as well as a pulp composition comprising the starch dispersion (Claim 5) (see wordings under Point II, *supra,* and paragraph [0001] of the patent in suit).

9.2 The description of the patent in suit indicates that the commercially available cationic starches, to be used as wet-end additives as well as for surface sizing, need be dissolved under heat prior to their addition to the papermaking stock or their application to the surface of the paper sheet (paragraph [0003]).

10. The closest prior art

10.1 In the decision under appeal, C20 is considered to be the most appropriate starting point in the assessment of inventive step. Opponent 1 considered C1 to be more appropriate, especially as regards method claim 6.

10.1.1 Considering the similarity in terms of technical issues addressed, subject-matter concerned (cationic starch dispersion, use thereof in papermaking, method of preparation, pulp composition comprising it), the Board holds that C20 is to be considered the closest prior art in the application of the problem-solution approach.

10.1.2 Indeed, like the patent in suit, C20 (Title) relates to crosslinked cationic starches and their use in papermaking, in particular for strengthening paper (page 1, lines 3 and 4; page 2, lines 11 and 12). C20 mentions the addition of the cationic starches at the wet end of the paper machine (page 1, line 14; page 2, line 15; page 3, lines 16-17; page 4, lines 24 to 27; page 8, lines 1 to 4; page 11, line 14; Claim 20). The use of the starch granules of C20 in papermaking usually requires a heating step.

10.1.3 More particularly, the most relevant disclosure of C20 is in the examples thereof, in particular Example C,

which is the closest embodiment to the invention claimed in the patent in suit.

10.2 Document C1 - not closest prior art

10.2.1 C1 (Page 1, lines 9 to 12) relates to starch-based aqueous, film-forming, and non-migrating adhesives, and to processes for the manufacture and use of such amylaceous adhesives. C1 (page 1, lines 69 to 75) is concerned with the problem of viscosity stability, more particularly (page 1, lines 92 to 94) low-viscosity stability, as (Page 2, lines 80 to 85) the penetration and the adhesion obtained with small granule fragments are improved compared the the use of non-fragmented granules, especially in the (surface) sizing of paper or of textile yarns. The examples of C1 all illustrate binding glass fibre sheets, sizing glass yarns or bottom, seam and ply pasting of paper bags.

10.2.2 The Board thus holds that C1 is further away than C20 from the issues addressed in the patent in suit and the claimed invention and does not, therefore, qualify as the closest prior art for the purpose of assessing inventive step.

11. The technical problem according to the Proprietor

At the oral proceedings before the Board, the Proprietor maintained that also in the light of C20 taken as the closest prior art the technical problem solved was that starch dispersions according to the invention, unlike the known cationic starch dispersions, needed not be dissolved under heat before being added to the papermaking stock (paragraph [0003] of the patent in suit), whilst also resulting in paper

having comparable properties (paragraph [0014] of the patent in suit).

12. The solution

As the solution to this technical problem, the patent in suit as amended proposes the following:

- the method for the preparation of the dispersion of cationic starch particles of Claim 6, which is characterised in particular by the step of

"*(b) processing the mixture using shear forces* ***in an extruder*** *in the presence of a crosslinker*",

and the dispersion according to Claim 11, obtainable by this preparation method;

- the pulp composition composition of Claim 5 comprising, and the use according to claim 1, in papermaking, of a starch dispersion characterised in that

"***the starch dispersion is obtained by a process comprising a) processing a mixture of cationic starch and an aqueous liquid using shear forces in an extruder and simultaneously crosslinking, or b) extruding a mixture of crosslinked cationic starch and an aqueous liquid in the presence of a hydroxylic liquid to form the dispersion.***".

13. The alleged success of the solution

13.1 Firstly, it is noted that C20 is not acknowledged in the application as filed, on which the patent in suit was granted, so that, when the problem stated in the

patent in suit was formulated, C20 was not taken into account. Neither was C20 considered during substantive examination of the application.

13.1.1 Secondly, it must be taken into account that C20 does not require the use of an extruder, as it aims at preserving the granular, swollen nature of the cationic starch (see, in particular, page 3, lines 14 to 17; page 6, lines 31 to 32; sentence bridging pages 7 and 8; page 8, lines 7 to 8). Moreover, the starch granules illustrated in the examples of C20 require a heating step for dispersion (see e.g. page 8, line 27; page 10, last two lines; page 11, line 7).

13.2 As regard Claims 6 and 11 and Claims 1 and 5, alternative a)

13.2.1 Dispersions obtained by the method according to Claim 6 may simply be dispersed in water, without requiring heating, prior to their use in papermaking, as shown in the examples of the patent in suit (page 5, lines 14 and 33; page 6, lines 54-55).

13.2.2 Hence, the problem of avoiding the step of dissolution/ dispersion under heating before adding the starch to the papermaking stock, as mentioned in the patent in suit, appears to be effectively solved.

13.2.3 However, the comparative data relating to the properties of the paper obtained when using the claimed starch dispersion, as illustrated in tables 1 and 2 do not permit to draw any conclusion as regards the comparison with the results achievable with the crosslinked starches of C20, since the comparison was made with respect to non-crosslinked commercial cationic starches.

13.3 As regards claims 1 and 5, alternative b)

13.3.1 As far as this subject-matter is concerned, which refers to starch dispersions obtainable by extruding an aqueous mixture of previously crosslinked cationic starch, no examples are contained in the patent in suit. Hence, it is not apparent how the arguments in support of the advantageous effects of the method of Claim 6 and the dispersion of Claim 11 could be applied.

14. Reformulation of the technical problems effectively solved

14.1 Based on the above considerations, only the problem of avoiding the need to apply heat in dissolving/ dispersing the starch before it is put to use can be considered to be effectively solved by the method of Claim 6, the dispersion of Clam 11 and the subject-matter of Claims 1 and 5, alternative a).

14.2 As regards the subject-matter of Claims 1 and 5, alternative b), the technical problem effectively solved can only be seen in providing of a further use of and composition comprising crosslinked cationic starch dispersions.

15. Obviousness

15.1 It remains to be decided whether starting from C20/ Example C, the claimed subject-matter was obvious to the person skilled in the art seeking to solve the technical problems posed, having regard to the state of the art.

More particularly, it has to be assessed whether the

person skilled in the art would have been motivated to modify the known method of preparation cationic starch dispersions disclosed in C20/Example C by incorporating a step of subjecting the starch being crosslinked, or the starch already crosslinked, to an extrusion.

15.1.1 C20/Example C (see Points 2, *supra*) teaches to first cationise, then cross-link under stirring, but does not teach to carry out the crosslinking using shear forces in an extruder, let alone the use of an extruder.

15.1.2 Indeed, C20 teaches away from using shear forces of an extruder, in so far it aims at preserving the granular, swollen shape of the starch, as apparent from the following parts of C20:
- "the granule size is to be controlled" (e.g. page 8, lines 7 and 8 and 13 and 14), and,
- "Such a characteristic is desirable because it enables the degree to which swelling occurs, to be controlled so that overswelling or bursting does not occur during cooking" (e.g. page 6, lines 30-32).

15.1.3 Thus, the skilled person starting from Example C of C20, with the aim to solve any of the problems posed, would not be motivated to crosslink the starch granules in an extruder, nor to extrude an already cross-linked cationic starch, as thereby the desired "disperse swollen, crosslinked and cationised granules of starch" would not be preserved. Instead, the person skilled in the art would expect that starch granules would be fragmented due to the shear forces acting on them in the extruder.

15.1.4 The different processing step of the method of Claim 6 has been shown to lead to modified starch products not requiring a dispersion/dissolution step under heating,

as expressly required by C20, before being used in papermaking.

15.1.5 Thus, the subject-matter of Claims 6 and 11, as well as the subject-matter of Claims 1 and 5, alternative a) is not obvious in the light of C20.

15.1.6 The use according to Claim 1, alternative b) and the pulp compositions according to Claim 5, alternative b), which both involve an aqueous starch dispersion obtained by extruding a previously crosslinked starch granules, are not obvious in the light of C20, if only because C20 does not hint at using an extrusion step, potentially detrimental to the desire of preventing the fragmentation of the crosslinked granules.

15.2 For the sake of completeness the Board also considered the relevance of C1

15.2.1 C1 neither suggests the use of cationic starch nor a process comprising simultaneous crosslinking and extruding of starch granules in an aqueous mixture. It has not been proven that the crosslinker used (before extruding) as described in C1 would inherently not be completely reacted and, therefore, still be active within the extruder.
Moreover, according to all the examples of C1 (which do not concern internal or surface sizing of paper), the (re)dispersion of the crosslinked starch fragments is carried out with live steam, hence under heating.

15.2.2 In the Board's judgement, C1, taken alone, does not, therefore lead to subject-matter falling within the ambit of the claims at issue in an obvious manner either.

15.2.3 C1 cannot be combined with C20, as C1 requires the fragmentation of crosslinked starch granules (page 3, lines 96-97), whilst this is to be avoided according to C20. Since C1 and C20 impose such contradictory measures, they are mutually incompatible and the skilled person would not, excluding hindsight considerations, combine their teachings in a manner leading to subject-matter falling within the ambit of the claims at issue.

15.3 Hence, the Board concludes that the subject-matter of independent method Claim 6, product-by-process Claim 11, use Claim 1 and pulp composition Claim 5, and of the claims dependent thereon, is not obvious in the light of C20, or C1, or a combination thereof.

15.4 The claimed subject-matter thus involves an inventive step (Articles 52(1) and 56 EPC).

Auxiliary Request 3 - sufficiency of disclosure

16. The objections raised were essentially based on the arguments
- that the type of the starch particles and their size range defined in the claims were insufficiently disclosed;
- that it was not clear which measuring method had to be used to determine said "*particle size*";
- that the skilled person did not know whether he was working within the forbidden area of the claims; and
- that method claim 6 did not require some features necessary for obtaining dispersions as claimed.

17. Objections focusing on the "*particle size*" features

17.1 According to independent Claim 1 the "*starch particles*

in the dispersion" have a "*particle size*" that "*ranges from 200nm to 100µm*". Likewise, the "*starch particles in the dispersion*" contained in the composition according to independent Claim 5 "*ranges from 200nm to 100µm*".

These claims (full wording under Point II, *supra*) thus only define upper and lower limits of the particle size range. They do not expressly prescribe a specific particle size distribution within the given range besides the requirement of being obtainable by one of the two preparation methods a) or b).

17.1.1 From the items of evidence undisputedly illustrating common general knowledge relating to starch and particle sizing also with laser diffraction, e.g. and C47 (e.g. Table 2.1 on Page 17), it is apparent that the indication of a particle size range is a conventional and usual way of describing starch particles, even without indicating a method of measurement.

17.1.2 The Board concludes that the absence, in Claims 1 and 5 at issue, of some express reference to the type(s) of the dispersed starch particles (granules, fragments thereof) and the method for measuring their size(s) does not necessarily make the patent's disclosure of the invention insufficient.

17.2 Moreover, as regard the determination of the size(s) of the dispersed starch particles, it is expressly indicated in the patent in suit (paragraph [0032?]) that "*the starch dispersions*" of the invention are "*characterised by a broad particle size distribution*" and that "*[a]ccording to **laser light scattering data** the particle size typically ranges from 200nm to 100µm*"

(emphasis added). Thus, the patent in suit expressly points out a technique suitable for ascertaining whether a starch dispersion meets the particle size criterion of Claims 1 and 5.

17.2.1 The Appellant referred to C44 and, more particularly, to C28, in support of its position that the skilled person was able to carry out the required particle size measurements by laser light scattering at the effective filing date of the patent in suit.

17.2.2 Document C44

C44 (see title) is a textbook published close to the priority date and illustrating common general knowledge in the field of particle characterization by light scattering methods. The chapter dealing with laser diffraction techniques contains the following statements (page 111, Point 3.1, first paragraph; page 113, last sentence of penultimate paragraph):
- "In the past two decades, laser diffraction has become a popular and important physical means for sizing industrial particles. Laser diffraction has to a large extent replaced conventional methods".
- "This is mainly due to the advantages of the technology: its ease of use and fast operation; its high reproducibility; and an extremely broad dynamic size range, spanning almost five orders of magnitude, from nanometers to millimeters".
- "To date, the spherical modeling approach is the only feasible choice for a commercial instrument designed to be used for a broad range of samples, no matter what the real particle shapes".

For the Board, C44 thus confirms that at the priority date of the patent in suit, laser light diffraction as

mentioned in the patent in suit was a well known and recognised method for determining particle size, applicable across a broad range of particles sizes.

17.2.3 Document C28

C28 is a declaration by a university professor in chemical engineering comprising *inter alia* the following statements
(Sections "Measuring Particle Sizes .. "):

"Back in 2000, which is still valid today, there was really one practical technique available for obtaining a reliable particle size measurement on samples ranging from 200 nm to 100 micrometre, which is Static Light Scattering (SLS) ..."

"In the year 2000, there were two popular commercial instruments using SLS: the Malvern Mastersizer 2000 and the Coulter LS230."

"As a professor at Queen's University, I have had a Mastersizer 2000 in my laboratory since approximately 2000. My students have conducted thousands of particle size measurements with this instrument, and I am familiar with its capabilities and limitations."

"While larger particles (>500microns) are often measured dry, smaller particles are most commonly measured as aqueous dispersions".

"The refractive index of the particles must be input to the software. After the correct sample concentration been added, analysis is initiated through the software, with each analysis requiring only a few minutes".

Professor Cunningham then comes to the following conclusions (C28: section "Recommended Procedure In The Year 2000"):

"In the year 2000, I would have used either a Malvern Mastersizer 2000 or a Coulter LS230 (Static Light Scattering) to determine if a starch sample was within the size range as specified in patent EP 1303667. I would have used a wet sample, i.e. an aqueous dispersion. A consideration would be the refractive index (RI) value to input into the software. While the RI for starch is known, the measured particles would actually probably be water-swollen starch particles, and therefore more accurate measurements would be obtained with the RI corrected for the extent of swelling with water. The extent of swelling would be influenced by the degree of crosslinking of the particles and the solids concentration in the instrument. Refractive index of polymers can be measured using a refractometer. The most reliable and accurate measurements would be obtained by measuring the RI of starch swollen with water to the same extent as the analysis conditions, and using this RI value in the Mastersizer 2000. I would typically run two to three samples in replicate to ensure there was no evidence of aggregation or particle settling (changes in the particle size distribution between the three samples)".

For the Board, this last statement clearly addresses and dispels the doubts cast by the opponents as regards the alleged difficulties that the person skilled in the art trying to carry out the measurements would encounter due to the lack of indications in the patent in suit as regards the refractive index of the swollen starch particle and the concentration to be used.

In view of C28, the Board has no reason to doubt that the person skilled in the art, prompted by paragraph [0034] of the patent in suit to determine the starch particle size using a laser light scattering and teaming up, if necessary, with a person experienced in this well-known technique, was able at the priority date of the patent in suit to determine reliably by means of this technique whether an aqueous dispersion of crosslinked starch particles meets the particle size requirement of Claims 1 and 5.

17.3 The Board holds that in this respect, the Opponents merely cast doubts on the possibility of carrying out the invention arguing that the description of the patent lacks details necessary for performing the particle size measurement by laser light diffraction, in particular indications of a suitable instrument, of the solvent to be used, of the refractive index value to be input, and of the concentration of the measured particles.

17.3.1 However, in C28 the "Malvern Mastersizer 2000" (a particle size analyser using laser light scattering commercialised by the company Malvern, see also document C26) is identified as a standard apparatus for particles size measurements, well known at the priority date of the patent, and easy to use. C28 attests that the determination of the refraction index was not impossible.

17.3.2 The information provided in operating manual C27 (chapter 8 entitled "Sample preparation", pages 8.2 to 8.9, more particularly under the heading "Considerations for wet samples") is entirely coherent with the statements in declaration C28 as regards the considerations involved and the precautions to be taken

in measuring the size(s) of particles dispersed in a liquid dispersant. For instance, water is considered as the most common or first choice dispersant. The importance of the refractive indices of the materials (solvents and particles), and of the sample concentration, are clearly addressed therein. Concerning the refractive index, C27 (page 4.12) states that the well known apparatus for the laser diffraction (Mastersizer 2000) also contains a database with a long list of refractive indexes for a number of substances including dispersions (latices), which may be supplemented with further refractive indices data as necessary. C28 gives indications on the way of measuring the refractive indexes.

17.3.3 On the basis of the evidence admitted into the proceedings, the Board concludes that the opponents have not convincingly shown that the person skilled person in the art would have encountered specific insurmountable difficulties in measuring the size(s) of starch particles in aqueous dispersions according to the invention, using the technique indicated in general terms in the description.

18. Neither is the Board convinced by the objection of insufficiency based on the "forbidden area of the claims" argument as raised by the opponents. According to established case law, a claim defined in terms of a range of parameter values, preventing the skilled person from always knowing without ambiguity whether he is working inside or outside the ambit of the claim due to the lack of precision of the measuring method used, is not necessarily objectionable for insufficiency of the disclosure. Instead, due to the lack of precision of the measuring method, a "grey area" may exist at the boundaries of the claim (near the limiting values of

said range), in which area it may not be unambiguously clear (Article 84 EPC) whether the invention is actually carried out. However, non-compliance with this Article 84 EPC is not in itself a ground for opposition.

For the Board, the opponents have not, in the present case, convincingly shown that such a possible ambiguity in ambit at the edges of the claim deprived the person skilled in the art of the promise of the invention (see e.g. T 608/07, Reasons, 2.5.2).

19. Objection against method Claim 6

19.1 On the basis of the evidence admitted into the proceedings, the Board also holds that the objection against claim 6 is *prima facie* not conclusive, since it has not been shown why a person skilled in the art would not be able to carry out a method comprising steps a), b) and c) of Claim 6.
Furthermore, Claim 6 (step c) does neither require that the dispersion be made already within the extruder, nor heating when dispersing the crosslinked starch particles. In this connection, reference is made to e.g. Example A, penultimate sentence.

19.2 The arguments based on experimental report C42 also invoked by the opponents in this connection were not considered in reaching this finding, as C42 was not admitted into the proceedings due to its *prima facie* lack of relevance (Point 3.2, *supra*).

20. Hence, in the Board's judgement, the claimed invention is disclosed in the patent in a manner sufficiently clear and complete for it to be carried out by a person

skilled in the art taking into account common general knowledge (Article 83 EPC).

Procedural aspects - alleged procedural violations by the Opposition Division

21. Right to be heard

21.1 At the oral proceedings, Opponent 1 no longer pursued its objection regarding an alleged violation of its right to be heard in the opposition proceedings. The Board has no reason to deviate from its preliminary opinion as expressed in its communication issued in preparation for the oral proceedings, which was essentially as follows.

21.2 According to the minutes of the oral proceedings before the Opposition Division (Point 2), the parties were heard regarding the issue of sufficiency, especially in respect of the feature of claim 1 reading "*the particle size of the starch particles in the starch dispersion ranges from 200nm to 100µm*".

21.3 In the decision under appeal (Reasons, II.2) it is indicated in detail why claim 1 was not found to be objectionable under Article 83 EPC in the light of the evidence on file, considering in particular C26 and C27. It is apparent from the reasons given that the experimental report C29 submitted by the Proprietor had not been decisive in reaching this conclusion, and therefore no particular passages of C29 were relied upon in its argumentation.

21.4 In the decision under appeal (page 7, last paragraph), the Opposition Division expressly noted that the Proprietor had sought to strengthen its position by

filing documents C26 to C29. The fact that the Opposition Division based its (positive) finding regarding sufficiency essentially on the contents of C26 and C27 does not mean that it did not consider the arguments of the Opponent 1 based on C28, but that these arguments were not found convincing enough to outweigh the teaching already provided by C26/C27.

21.5 As is apparent from the minutes of the oral proceedings before the Opposition Division (Point 7.3), the "Opponents had **no objections** as regards **novelty**" in respect of the claims held allowable by the Opposition Division (then and now Third Auxiliary Request). Therefore, the Opposition Division simply noted this in the decision under point II.9, and considered it as a confirmation of its view that the claimed subject-matter was novel, needing no further explanation. In said Minutes (Point 7.5) and in the written decision (see point II.11) the issue of inventive step is addressed also with regard to Claim 6, taking into account the Opponents' approaches based on both C20 and C1, and reasons are given as regards the non-obviousness of the subject-matter of this claim.

22. Alleged violation of the principle *ne bis in idem*

22.1 In writing, Opponent 1 also invoked an alleged violation of the principle *ne bis in idem*, arguing that since in the parallel case of European Patent no. 1 303 670, involving the same parties and the same objection regarding sufficiency, the same Opposition Division had already concluded that absent further indications regarding details of the laser scattering measuring method used the claimed invention could not be reproduced, this finding had to be applied also in the present case.

22.2 This objection was no longer pursued by Opponent 1 during the oral proceedings and appears *prima facie* not relevant for the reason that the subject matter of both proceedings was different, in other words that different patents were at stake. Bar further arguments by Opponent 1, the Board however sees no need to further elaborate on this matter of its own motion.

23. Thus, in the Board's judgement, the decision of the opposition division is not tainted by a procedural violation that could justify a remittal of the case (let alone a reimbursement of the appeal fee).

Nor can he board identify any procedural shortcomings or constraints that would prevent it from deciding on the substance of the case.

Conclusion

The patent in the amended form held allowable by the Opposition Division (Auxiliary Request 3 at issue) is not objectionable on the grounds invoked by the Respondents, whilst none of the higher-ranking requests of the Patent proprietor is allowable.

Order

For these reasons it is decided that:

All appeals are dismissed.

The Registrar: The Chairman:

D. Magliano B. Czech

Decision electronically authenticated