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**Datasheet for the decision  
of 27 September 2012**

**Case Number:** T 1591/08 - 3.3.07

**Application Number:** 98941707.6

**Publication Number:** 1016741

**IPC:** D01F 6/62, D01F 6/84,  
C08L 67/02, C08G 63/672,  
C08G 63/682

**Language of the proceedings:** EN

**Title of invention:**  
Polyester fiber and fabrics made by using the same

**Patent Proprietor:**  
Teijin Fibers Limited

**Opponents:**  
Shell Internationale Research Maatschappij B.V.  
Zimmer AG

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56  
RPBA Art. 12

**Keyword:**  
"Evidence filed with the statement setting out the grounds of  
appeal - admissible (yes)"  
"Inventive step (no) - obvious solution - Main and Auxiliary  
Requests"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 1591/08 - 3.3.07

**DECISION**  
of the Technical Board of Appeal 3.3.07  
of 27 September 2012

**Appellant I:** Shell Internationale Research Maatschappij  
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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
20 June 2008 concerning maintenance of European  
patent No. 1016741 in amended form.

**Composition of the Board:**

**Chairman:** F. Rousseau  
**Members:** G. Santavicca  
P. Schmitz

## Summary of Facts and Submissions

- I. Two appeals, by both opponents, lie from the interlocutory decision of the Opposition Division, according to which, account being taken of Claims 1 to 7 of the Main Request filed with letter of 27 July 2006 and of a description adapted thereto during the oral proceedings held on 28 May 2008, European patent 1 016 741 (application N° 98941707.6 published as WO99/11845) and the invention to which it relates met the requirements of the EPC.
- II. Claim 1 of the Main Request underlying the decision under appeal read as follows (compared to Claim 1 as granted, additional features are indicated in bold, deleted features in strike-through):
- "1. Polyester fibers with a limiting viscosity of 0.4-2 that satisfy the following conditions (1) to (~~5~~6)
- (1) being composed of at least 90% by weight of poly(trimethylene terephthalate),
  - (2) containing a phosphorus compound at 10-250 ppm in terms of weight of elemental phosphorus,
  - (3) containing no more than 3 wt% of cyclic dimers,
  - (4) containing 0.4 to 2 wt% of bis(3-hydroxypropyl) ether copolymerized with poly(trimethylene terephthalate), and
  - (5) having a birefringence of 0.03 or greater, and
  - (6) the proportion of the number of moles of the elemental phosphorus in the phosphorus compound with respect to the number of moles of the metal element used as the polycondensation catalyst is 0.4-3."**

- III. The patent had been opposed in its entirety on the grounds of lack of novelty and inventive step (Article 100(a) EPC) as well as (opponents 01) of insufficient disclosure (Article 100(b) EPC) and extension of the subject-matter of the patent beyond the content of the application as filed (Article 100(c) EPC).
- IV. In the decision under appeal, as regards inventive step, the only issue dealt with in the present decision, it was *inter alia* held that the problem to be solved was to provide poly(trimethylene terephthalate) (PTMT) fibres of high whiteness, excellent strength and tenacity, which could be clearly dyed. D2 (EP-A-0 859 020), which was considered as the closest prior art document, did not give any guidance to provide fibres having high whiteness, excellent strength and tenacity as required in the patent in suit. So, the claimed subject-matter was not obvious over D2. D6 (H.L. Traub et al, *Synthesis and properties of fiber-grade poly(trimethylene terephthalate)*, Die Angewandte Makromolekulare Chemie, 230 (1995), pages 179-187) disclosed poly(trimethylene terephthalate) having a remarkable degree of whiteness. However, the content of bis-(3-hydroxypropyl)ether (BPE) in the polymer of D6 was outside the range defined in Claim 1, which range was critical for the dyeability of the fibres. Also, D6 did not mention mechanical properties of the fibres such as strength and tenacity. Even if D6 were combined with D21 (EP-A-0 373 238), concerning melt spun poly(ethylene terephthalate) fibres of high whiteness and excellent dyeability, this combination would not lead the skilled person to the claimed fibres, as D21 did not concern a polymer derived from

- trimethylene glycol units. Hence, neither D6 nor D21 rendered the claimed subject-matter obvious.
- V. In their statement setting out the grounds of appeal, appellants 01 (opponents 01) enclosed further items of evidence, *inter alia* D34 (Hansjörg Ludwig Traub, PhD thesis, presented on 7 February 1994), in order to supplement the disclosure of D6 with respect to the issue of inventive step.
- VI. In their statement setting out the grounds of appeal, appellants 02 (opponents 02) referred to evidence and arguments produced in opposition proceedings to attack the decision under appeal to the extent that novelty over D2 had been acknowledged. Then, in their letter of 5 August 2009, appellants 02 *inter alia* argued lack of an inventive step over D6 as the closest prior art combined with D34.
- VII. In their response to the statements setting out the grounds of appeal (letter of 28 April 2009), the patent proprietors (respondents) enclosed further documents, *inter alia* D35 (S. Grebowicz et al, *Deformation of undrawn poly(trimethylene terephthalate) (PTT) fibers*, Polymer 42(2001) 7153-7160), maintained their Main Request and submitted an Auxiliary Request. Claim 1 of the Auxiliary Request differed from Claim 1 of the Main Request (*supra*) only in that the range defined in item (6) was restricted to 0.55-3. Then, in their letter of 15 December 2009, they provided arguments *inter alia* against the combination of D6 and D34 invoked by both appellants.

- VIII. In a communication of 27 September 2011 in preparation for oral proceedings, the Board indicated the issues that needed debate and decision. As regards inventive step, the Board *inter alia* noted that D6 was more relevant than D2 as the closest prior art. Also, that the attainment of an improvement over the prior art, over the whole breadth of Claim 1, did not appear to be plausible. Finally, that the problem stated in the patent in suit might need reformulation, e.g. as to provide further PTMT polyester fibres.
- IX. With letter of 12 October 2012, the respondents requested a postponement of the oral proceedings, in order to have more time for dealing with the issues raised. Having regard to the criticality of the issues raised, the oral proceedings were postponed.
- X. By letter of 13 August 2012, appellants 01 announced that they would not be represented at the oral proceedings. By letter of 20 September 2012, the respondents (patent proprietors) informed the Board that they too would not be represented at the oral proceedings. Thus, pursuant to Rule EPC 115(2) EPC, Oral proceedings were held on 27 September 2012, in the announced absence of the respondents and appellants 01.
- XI. As regards the admissibility of late filed evidence such as D34 and inventive step over D6 as the closest prior art, i.e. the issues dealt with in the present decision, the appellants essentially argued as follows:

*New items of evidence*

- (a) D34, the Philosophy Doctoral thesis of one of the authors of D6, showed the knowledge of the skilled person in the field of PTMT in 1994. It also described in detail some of the experiments of D6. Thus, D34 was relevant and should be admitted.

*Main Request*

- (a) D6, which concerned synthesis and properties of fibre-grade PTMT and described conditions for the polycondensation and spinning of PTMT, and its properties, was the closest prior art document.
  
- (b) The poly(trimethylene terephthalate) (PTMT) of D6 was synthesised from dimethyl terephthalate (DMT) and 1,3-propanediol (1,3-PDO) in the presence of titanium tetrabutylate and tributyl phosphite. It was not in dispute that the polymer disclosed by D6 was composed almost entirely of PTMT having a limiting viscosity as defined in Claim 1. Since the method described in D6 corresponded to one of those used in the patent in suit to produce the polymer for the fibres with all of the features of current Claim 1, it also gave a content of by-products such as cyclic dimers below 3 % by weight. This implicit disclosure was confirmed by D7 (S. Schauhoff et al, *New developments in the production of polytrimethylene terephthalate (PTT)*, Chemical Fibers International, Volume 46, September 1996, pages 263-264), also concerning PTMT fibres having good dyeability. As to the birefringence defined in Claim 1, its minimum value was an absolutely

necessary condition, which fact was apparent from the patent itself (paragraph [0057]).

- (c) The presence of bis-(3-hydroxypropyl)ether (BPE) in the PTMT of D6, which was estimated to be below 0.1%, was the only technical difference over the PTMT of the fibres of Claim 1.
- (d) According to Paragraph [0035] of the patent in suit, an amount of 0.4 to 2 wt% of BPE as defined in Claim 1 improved the dyeability of the PTMT fibres.
- (e) However, this effect invoked by the respondents had not been demonstrated across the whole scope of Claim 1. In fact, whilst the BPE content of the polymeric material according to the Examples of the patent in suit (Table 2) ranged from 0.72 to 0.88, that contained in the material of Comparative Example 4 was 2.1 wt%, i.e. lay just above the range defined in Claim 1, and the relevant fibres had poor dyeability. Hence, the PTMT material having a BPE content at the upper end of the range defined in Claim 1 did not solve the problem. As stated in the patent in suit, desired dyeability (including light fastness) was attainable only if the BPE content was from 0.5 to 1 wt.%.
- (f) The problem solved by the presence of BPE in the fibres of the patent in suit was the provision of further PTMT fibres having good dyeability.
- (g) The claimed solution was obvious to the skilled person starting from D6 and using common general knowledge, as represented by D7 and D34. In fact,



D7 disclosed that in PTMT fibres having good dyeability, most (85%) of the by-products were cyclic dimers, the content of which was usually below 3% by weight. As regards D34, it disclosed that a marked content of bis(3-hydroxypropyl)ether not only reduced the resistance to light and to oxidative decomposition but also led to a drop of the glass transition temperature of the polymer, which drop in glass transition temperature was beneficial for the dyeing properties. Still D34 showed that the birefringence of PTMT fibres was always higher than 0.04 for usual spinning speeds.

- (h) Thus, before the priority date of the patent in suit, the skilled person knew that the presence of BPE increased the dyeability of PTMT fibres, which inherently had a birefringence of greater than 0.04.
  
- (i) Also, it was known at the date of filing of the patent in suit that the free proton in terephthalic acid (TPA) accelerated the formation of BPE. Thus, that the choice of a TPA-route for making PTMT would inevitably result in a raised level of BPE, as defined in Claim 1, in comparison to a DMT-route, as in D6. The patent in suit itself demonstrated that the replacement of the DMT-route by the TPA-route, in a polymerisation process wherein all other factors were kept constant, resulted in PTMT fibres with a BPE content in the range of from 0.4 to 2 wt% (Example 1 in comparison with Reference Example 1).
  
- (j) Thus, at the priority date of the patent in suit, the skilled person starting from D6 and wishing to

produce PTMT fibres with good dyeability would monitor the content of BPE in the PTMT polymer, or use a TPA-route in the polymerisation process, to obtain the desired BPE content.

- (k) Therefore, the subject-matter of Claim 1 of the Main Request was obvious in the light of D6 when combined with the common general knowledge of D7 and/or D34.

*Auxiliary Request*

- (l) The further limitation of feature (6) (named "X-value") of Claim 1 of the Auxiliary Request was also known from D6. So the further limitation had no influence on the choice of the closest prior art (still D6) and on the formulation of the problem solved by the claimed subject-matter. Hence, the ground of obviousness against the subject-matter of Claim 1 of the Main Request applied *mutatis mutandis* against the subject-matter of Claim 1 of the Auxiliary Request.

XII. As regards the admissibility of late filed evidence D34 and D35, and inventive step over D6, i.e. the issues dealt with in the present decision, the respondents, in writing (letter of 28 April 2009, in particular: Page 4, second full paragraph; Page 12, second to fourth paragraph; Point 6.2. As well as Letter of 15 December 2009, in particular: Point 3.2; page 14, second full paragraph), essentially argued as follows:

*New items of evidence*

- (a) D34 had been filed late, was not relevant and should not be admitted into the appeal proceedings. D35 had been filed to show that birefringence increased with increasing speed, hence in reaction to the allegation that a birefringence of at least 0.03 was an absolute necessity.

*Main Request*

- (b) D6 concerned PTMT polymers not fibres. It contained no information concerning the critical features according to claim 1 such as the BPE content and the minimum birefringence, nor about the dye affinity of PTMT fibres. Also, the addition of Phosphorus in D6 was used to block heavy metals. Furthermore, although D6 had long been known by the opponents, only in the appeal proceedings it had been combined with D34. Hence, D6 should not be considered to represent the closest prior art.
- (c) From the amounts of titanium catalyst and phosphorus compound disclosed in D6, the X-value calculated was 0.5 to 1. So the X-value defined by feature (2) of Claim 1 was disclosed in D6.
- (d) The subject-matter of Claim 1 differed from the disclosure of D6 in the following features:
  - (i) BPE content, as D6 disclosed a BPE content of less than 0.1% that was outside the range specified by feature (4) of Claim 1;

- (ii) cyclic dimer content, as D6 did not disclose a cyclic dimer content of its PTMT polymer as defined by feature (3) of Claim 1;
- (iii) physical properties, as D6 did not disclose a birefringence value as defined in feature (5) of Claim 1.

In fact, D6 did not disclose any spinning of the obtained PTMT polymer to make the corresponding fibres. Whilst D6 mentioned that the authors had reported on physical properties and dye affinity of the PTMT fibres (allegedly disclosed in References 2 and 3 mentioned on page 180 of D6), there was no disclosure of those reports which could be checked by a third party.

The mechanical properties and the birefringence were however dependent on the spinning speed, as apparent from D34, which showed a birefringence of greater than 0.04 when the spinning speed was greater than 2000 m/min, and D35, which showed that birefringence of fibres spun at a spinning speed less than 2000 m/min was less than 0.03. So the birefringence condition was not automatically met and D6 neither disclosed physical properties of PTMT fibres nor their dye affinity.

- (e) As to the argument of the opponents that the problem was not solved over the whole scope of Claim 1, it was referred to Comparative Example 4 of the patent in suit, where use was made of a BPE content of 2.1 wt%, i.e. outside the range defined by feature (4) of Claim 1, and the effect of the invention was not obtained. Thereby, however, it

was not proven that the effect of the invention was not obtained with a content of BPE in the range of 1-2 wt%. So the argument was not convincing.

- (f) As regards obviousness, already the fact that Claim 1 differed from the disclosure of D6 in 3 features, whilst the arguments of the opponents in support of lack of an inventive step relied on distinguishing feature (4) only, i.e. distinguishing features (3) and (5) were not addressed, was an indication that the ground of lack of inventive step must fail.
- (g) As regards the arguments that the priority document of the patent in suit taught that free protons in TPA accelerated the formation of BPE, i.e. that feature (4) of Claim 1 was self-evident to a person skilled in the art, the priority application of the patent in suit was not a pre-published document, nor had it ever been proven by evidence that the relevant disclosure was in fact common technical knowledge among those skilled in the art prior to the date of filing of the priority application. Thus, this disclosure was knowledge gained by the inventors of the patent in suit.
- (h) D6 disclosed that a reduced glass transition point (due to ethers such as BPE) of the polyester was beneficial for dye affinity. However, D6 also disclosed that the presence of ethers definitely impaired light fastness and oxidative decomposition resistance of the PTMT fibres. In view of these drawbacks and the absence of a disclosure for a spinning process for the polymers of D6, there was

no motivation for the skilled person at using a BPE level as defined in Claim 1 of the Main Request. So D6 alone did not suggest the claimed fibre solution.

(i) Also, the combination of D6 with D34 would not lead the skilled person to apply the conditions defined by features (3) and (5) of Claim 1.

(j) Thus, the claimed subject-matter was not obvious.

#### *Auxiliary Request*

(k) The above conclusion applied *a fortiori* to the claims of the Auxiliary Request.

XIII. Appellants 01 and 02 requested that the decision under appeal be set aside and the patent be revoked.

XIV. The Respondents (Patent Proprietors) requested that the appeals be dismissed, alternatively that the patent be maintained on the basis of the claims of the Auxiliary Request submitted with letter of 10 April 2008.

#### **Reasons for the Decision**

1. The appeals are admissible.

#### *Procedural matters - new items of evidence*

2. D34 was submitted with the statement setting out the grounds of appeal in reaction to the decision under appeal, which found that the amount of BPE in D6 was outside the range defined in Claim 1, that D6 did not

address the criticality of this feature for the PTMT fibres' dyeability, that D21 concerned poly(ethylene therephthalate) and that no mechanical properties of the fibres were disclosed in D6. Thus, D34 represents a legitimate reaction to the decision under appeal, i.e. in order to provide a missing link in the reasoning chain on inventive step when starting from D6.

3. As acknowledged by the Boards of Appeal of the EPO (Case Law, 6th edition, 2010, VII.C.1.5.2), the submission of further prior art found by an opponent in response to an alleged missing link in his chain of arguments, as set out in a decision under appeal, wherein the new prior art is enclosed in the statement setting out the grounds of appeal, may be admitted into the proceedings instead of being considered late.
  - 3.1 On the other hand, since D6 was always present in the examination and opposition proceedings, and since D34 is one of the references of D6, D34 could indisputably have been submitted earlier. The non admission of documents such as D34, enclosed in the statement setting out the grounds of appeal but that could have been submitted earlier, is within the power of the Board (Article 12(4) Rules of Procedure of the Boards of Appeal) (RPBA), e.g. in case of abuse. Such is not the case here, as D34 was submitted in reaction to the decision under appeal (*supra*).
  - 3.2 The respondents, who objected to the admissibility of D34 (*supra*), have had sufficient time to react. In fact, they submitted arguments against the relevance of D34, and counter evidence as well (e.g. D35). So admission

of late filed evidence D34 is at the discretion of the Board and only depends on relevance.

3.3 The relevance of D34 is immediately apparent (*infra*). It is the only document dealing with the contrasting effects arising from the presence of BPE in the melt, from which fibres are spun, as in the patent in suit. Since Claim 1 requires a particular content of BPE, and since the cited content of D34 reflects the alleged lack of evidence on the knowledge of the contrasting effects of the content of BPE, D34 is highly relevant.

3.4 Therefore, D34 is admitted into the proceedings.

3.5 Since D34 is admitted for consideration, the Board deems it appropriate also to admit D35, which was submitted in reaction to D34, thus to properly assess the arguments of the respondents in relation to the minimum birefringence value.

#### *Main Request*

#### *Amendments*

3.6 Compared to Claim 1 as granted, Claim 1 of the Main Request comprises the additional features of Claim 2 as granted, which was dependent on Claim 1 as granted. The amended claims fulfil the requirements of Article 123, paragraphs (2) and (3) EPC, which is not contested.

#### *Novelty*

4. The claimed subject-matter is novel over D6. The features which distinguish the claimed subject-matter



from the disclosure of D6 will be apparent from the assessment of inventive step (*infra*).

*Closest prior art*

5. The patent in suit concerns polyester fibres and fabrics made by using the same (title).
- 5.1 In particular, the patent in suit concerns polyester fibres with excellent whiteness and tenacity that are produced from poly(trimethylene terephthalate) resin with excellent whiteness, spinning stability and vastly minimized molecular weight reduction when molten (Paragraph [0001]).
- 5.2 The parties have argued D2 and D6 as closest prior art documents. D6 is more appropriate than D2 as the closest prior art document, for the following reasons:
  - 5.2.1 D2 and D6 concern the production of poly(trimethylene terephthalate) resins sharing a number of features with the polymer from which the claimed fibres are produced. However, D2 merely mentions that its polymers can be applied in the entire field of fibres and mould bodies (Page 2, lines 7-8). Instead, D6 not only concerns synthesis and properties of **fibre-grade** (emphasis added by the Board) poly(trimethylene terephthalate) (PTMT) but also mentions mechanical characteristics and dyeing properties of PTMT fibres.
  - 5.2.2 D6 describes the results of a study to investigate in detail not only the polycondensation on a technical scale but also the properties of the polymer for its processing via melt-spinning, i.e. to produce fibres.

D6 states that "the mechanical characteristics of the PTMT fibres as well as dyeing properties are reported elsewhere", making reference to two articles by the authors of D6 (Page 180, first full paragraph, last sentence). Also, in paragraph "Melt viscosity" (bridging pages 185 and 186; first sentence on page 185; last four lines of page 186) of D6, it is explicitly mentioned that the PTMT should be processed into fibres.

5.2.3 Thus in contrast to D2, D6 not only discloses the suitability of its polymers for producing PTMT fibres but also the fact that its authors have produced and tested the mechanical and dyeing properties of those PTMT fibres, and reported the results elsewhere.

5.2.4 Hence, D6 rather than D2 addresses objectives similar to those mentioned in the patent in suit, such as mechanical properties and dyeability of PTMT fibres.

5.3 So D6 is the closest prior art document.

*The disclosure of D6*

6. D6 discloses a poly(trimethylene terephthalate) having a limiting viscosity number ranging from 40 to 100 mL/g (sentence bridging pages 184 and 185) (i.e. of 0.4 to 1 dl/g, if expressed with the same units used in Tables 1 and 2 of the patent in suit).

6.1 The synthesis of the polymer of D6 is carried out (as described on page 181 of D6) as follows:

- (a) trans-esterification of dimethyl terephthalate (DMT) with 1,3 propanediol, at 140-220°C, under a nitrogen atmosphere, with a molar ratio of DMT to

diol in the range of 1.4-2.2, with  $6 \times 10^{-3}$  mol titanium tetrabutylate as catalyst, to obtain a mixture, mainly containing bis-1,3-hydroxypropyl terephthalate and **some oligomeric esters** (emphasis added) (page 181, first full paragraph, lines 1-6), which without purification, is submitted to;

- (b) polycondensation, at 260/270 °C, under reduced pressure, while distilling off 1,3-propane diol, as fast and as completely as possible from the viscous mass, in order to attain a high molecular weight (page 181, first full paragraph, lines 6-10).

6.1.1 In this way, PTMT was produced on a 15 kg scale from 45 mol of DMT (8.74 kg) and 101 mol of 1,3-propanediol (7.70 kg) (page 181, first full paragraph, lines 13-15).

6.1.2 As regards the by-product occurring with the polymer synthesis, in addition to the unspecified "some oligomeric esters" (*supra*) produced during the transesterification, D6 discloses on Page 182 that, when PTMT is formed via polycondensation, non only volatile compounds such as allyl alcohol (in an amount of approximately 1-2 g per kg of 1,3 propanediol employed) and acrolein (in roughly the same amount of allyl alcohol) are formed, but also bis-3-hydroxypropyl ether groups (i.e. BPE as defined in Claim 1 of the patent in suit) (in a detected amount of below 0.1%).

6.1.3 It is apparent from the foregoing, and it has never been contested, that the polymer obtained in D6 is composed of at least 90% by weight of poly(trimethylene terephthalate), as defined in feature (1) of Claim 1.

6.1.4 It is further apparent that the information "some oligomeric esters" (whereby oligomeric esters include cyclic esters), having regard to the indefiniteness of the term "some", cannot represent a direct and unambiguous disclosure of a content of no more than 3 wt.% of cyclic dimers as defined in feature (3) of Claim 1. Hence, the question arises whether feature (3) of Claim 1 is really distinguishing.

6.2 Still according to D6, in further experiments, the concentration of the Ti catalyst was reduced to  $2 \times 10^{-4}$  mol per mol of DMT and  $1-2 \times 10^{-4}$  mol tributyl phosphite per mol DMT were added after transesterification, which resulted in improvement of inter alia the colour of the polymer (page 181, fourth full paragraph).

6.2.1 It is not contested that the following features of Claim 1 are implicit from this passage of D6, namely:

(a) an amount of elemental phosphorus as defined in feature (2) of Claim 1, which is fulfilled by the amount of tributyl phosphite added during the synthesis in D6.

(b) a X-value (i.e. the ratio defined in Feature (6) of Claim 1) ranging from 0.5 to 1.

This is apparent from the respondents' submissions in their letter in appeal proceedings of 28 April 2009 (page 19, first and second full paragraph), where feature (2) of Claim 1 is not mentioned as one of the distinguishing features over D6, and where it is stated that feature (6) of Claim 1 may be considered to be disclosed by D6.

6.3 It follows from the above description of D6, that the fibres of Claim 1 are distinguished from D6 by features

(4) (BPE content) and (5) (birefringence), and possibly also by feature (3).

*Problem solved*

7. The problem addressed in the patent specification (Paragraphs [0015] and [0016]) is to provide PTMT polyester fibres having excellent whiteness and tenacity, excellent spinning ability, which can be clearly dyed.
  - 7.1 Some of the sought-for properties are illustrated and quantified in Table 2 of the patent-in-suit. Apart from the b value (which measures the discoloration, if any, of polymer and fibres), no properties related to the dyeability are illustrated.
  - 7.2 D6 discloses (page 187, Final remarks on material properties; third and fourth sentences) that "*fibres from PTMT may be dyed at the boil without the necessity to employ organic carriers*". The respondents have argued that the amount of BPE impacts on dye exhaustion. However, the attainment of any such improvement by the claimed subject-matter, over the whole breadth of Claim 1, over D6 has never been demonstrated.
  - 7.3 Among the examples of the patent in suit (Tables 1 and 2), Reference Examples 2 and 3 have an X-value of between 0.5 to 1 and a BPE content of less than 0.1%, as disclosed by D6, in addition to other features such as the amount of polymer, its intrinsic viscosity and the absence of cobalt. The cyclic dimer content is not quantified in D6, so no comparison is possible. The b value is higher than the value disclosed in D6.

Nevertheless, the fibres of these reference examples have a b value not higher than that of the polymer from which they are spun. Also, the mechanical properties and the birefringence are comparable to those indicated for the examples of the patent in suit. Hence, no improvement in terms of mechanical properties or dyeability over the prior art D6, let alone over the whole breadth of Claim 1, is apparent on the basis of available evidence.

- 7.4 Since the problem solved cannot be formulated in terms of an improvement over D6, it needs to be redefined, based upon the information present in the application as filed (see Case Law, *supra*, I.D.4.4), as to provide further PTMT polyester fibres that can be dyed. The Board is satisfied that this problem is successfully solved by the subject-matter of Claim 1 of the Main Request.

*Obviousness*

8. It remains to be decided whether the skilled person starting from D6 and aiming at solving the problem formulated above would have been motivated at applying a solution as defined in Claim 1 of the Main Request, in particular at using features (3) to (5) thereof, namely:
- (a) no more than 3 wt% of cyclic dimers;
  - (b) 0.4 to 2 wt% of BPE copolymerized with PTMT; and,
  - (c) a birefringence of 0.03 or greater.

- 8.2 As regards cyclic dimer and BPE contents (features (3) and (4) of Claim 1), the following is noted:

- (a) D6 discloses that the polycondensation temperature is in the range of 260-270°C (Page 181, line 8). According to the patent in suit, this is the preferred temperature range enabling the attainment of a good balance between reaction rate and cyclic dimer content.
- (b) Also, D6 (Page 180, second full paragraph) teaches that the synthesis of PTMT can be carried out by direct esterification of terephthalic acid (TPA), trans-esterification of DMT (DMT-route) being chosen in D6 only because of its easier handling in laboratory. According to the patent in suit (Paragraph [0051]), a TPA-route leads to a content of cyclic dimers of 2-3% by weight and an amount of BPE of 0.5-1% by weight.
- (c) That knowledge about oligomer content mentioned in the patent in suit was common before the priority date of the patent in suit, as confirmed by D7, which discloses (Paragraph bridging pages 263 and 264) that PTMT produced by the TPA-route have an oligomer content of 1.6-3.2%, formed during polycondensation, and consisting of up to 85% of a cyclic dimer, hence less than 3%.
- (d) Hence, the cyclic dimer content defined in feature (3) of Claim 1, if not already obtained when carrying out the process of D6 using a polycondensation temperature of 260-270°C, was the result from the obvious measure suggested in D6 for making further PTMT fibres that can be dyed, namely by the TPA-route.

8.3 As to the amount of BPE as defined in feature (4) of Claim 1, it should also be considered that D34, one of the references mentioned in D6, *inter alia* discloses

(Page 55, Section 3.3.4 (translated into English by Opponents 01 in Point 7.6 of their Statement setting out the grounds of appeal)) that:

*"In synthesis of polytrimethylene terephthalate, similarly to polyethylene terephthalate, the corresponding ether, bis(3-hydroxypropyl)ether, is formed and condensed during polycondensation during chain synthesis. The ether content of a polyester is of decisive importance for the reduction in light resistance and the less favourable resistance to oxidative decomposition. Moreover, if there is a marked ether content, the melting point also drops, as well as the glass transition temperature of the polymer. The reduction in glass transition temperature, however, has a beneficial effect on the dyeing properties of the polyester."*

8.3.1 It follows from this statement in D34, that the skilled person knew, before the priority date of the patent in suit, that the level of BPE in the PTMT might be adjusted in order to attain a compromise between resistance to light degradation and resistance to oxidative decomposition, on the one hand, and dyeing properties, on the other hand.

8.3.2 On the basis of this knowledge, for the skilled person wishing to solve the problem formulated above, the choice of a content of BPE within the range defined in feature (4) of Claim 1, if not already obtained from the choice of the TPA-route to produce PTMT, would be a measure with predictable results.



8.4 Therefore, the choice of a content of cyclic dimers and BPE as defined in Claim 1 in order to provide further PTMT polyester fibres that can be dyed was obvious.

8.5 As regards the minimum birefringence, D34 (Page 68, Figure 28) discloses that the birefringence of PTMT fibres obtained from the polymer of D6 is higher than 0.04 at spinning speeds from 2000 to 5000 m/min. D34 does not disclose, let alone suggest, spinning speeds of less than 2000 m/min, nor values of birefringence relating to these spinning speeds. Hence, from D34, to solve the above problem, the skilled person would form fibres having a birefringence of at least 0.04, i.e. by using spinning speeds between 2000 and 5000 m/min.

8.6 D35, invoked by the respondents, is a post-published document, which therefore could not have influenced the skilled person who sought to solve the problem formulated above before the priority date of the patent in suit. Even if the disclosure of D35 reflected the background art before the priority date of the patent in suit, it is not apparent to the Board that D35 hints at necessarily using PTMT fibres having a birefringence of less than 0.03. Nevertheless, the mere fact that D35 might have suggested a different solution, would it have been published before the priority date of the patent in suit, does not change the fact that D34 disclosed a solution which was available to the skilled person for providing further PTMT fibres that could be dyed.

8.7 It follows from the foregoing, that the subject-matter of Claim 1 of the Main Request was obvious having regard to the disclosure of D6 as supplemented by D34,

or possibly by D7, wherein D7 and D34 reflect general knowledge of the skilled person.

- 8.8 Thus, the claimed subject-matter of the Main Request does not fulfil the requirements of the EPC.

#### *Auxiliary Request*

#### *Amendments*

9. Compared to the Main Request (*supra*), Claim 1 of the Auxiliary Request contains the restriction of the limitation defined in Claim 2 as granted (identified by the parties as "X-value"), from 0.4-3 to 0.55-3. This amendment finds its basis in the description as filed (page 12, line 11), where the following ranges for the "X-value" are disclosed: 0.4-3 and 0.55-2. Hence, the amended claims of the auxiliary request too fulfil the requirements of Article 123(2) EPC.

#### *Inventive step*

10. The restriction of the "X-value" to the range of 0.55 to 3, as in Claim 1 of the Auxiliary Request, does not represent a distinguishing feature over the prior art D6, which indisputably discloses a "X-value" of 0.5 to 1. This amendment therefore has no effect on the assessment of inventive step as made for the Main Request. Hence, also the subject-matter of Claim 1 according to the Auxiliary Request was obvious over D6, D7 and D34 as established for the Main Request.

#### *Conclusion*

11. The patent as amended in the form of the Main and Auxiliary Requests does not fulfil the requirements of the EPC.

## **Order**

### **For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

S. Fabiani

F. Rousseau