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Datasheet for the decision of 19 April 2024

Case Number: T 0414/22 - 3.3.03

Application Number: 15783988.7

Publication Number: 3212712

IPC: C08L23/12, C08L23/16, C08K5/00, C08F8/50

Language of the proceedings: EN

Title of invention:
HETEROPHASIC POLYPROPYLENE WITH IMPROVED PUNCTURE RESPECTIVELY IMPACT STRENGTH/STIFFNESS BALANCE

Patent Proprietor:
Borealis AG

Opponents:
SABIC Global Technologies B.V. /
SABIC Petrochemicals B.V.
Ineos Europe AG
Basell Poliolefine Italia S.r.l.

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (yes)

Decisions cited:
T 0192/82, T 0035/85, T 0197/86, T 0939/92

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Case Number: T 0414/22 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 19 April 2024

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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted on 14 December 2021 concerning maintenance of the European Patent No. 3212712 in amended form.**

Composition of the Board:

Chairman D. Semino
Members: O. Dury
R. Cramer

Summary of Facts and Submissions

I. The appeal of opponent 2 lies from the interlocutory decision of the opposition division concerning maintenance of European patent No. 3 212 712 in amended form on the basis of the claims of the main request filed during the oral proceedings held on 23 September 2021 and an adapted description.

II. The following documents were, among others, cited in the decision under appeal:

D6: WO 2004/087807 A1
D29A: Polypropylene and other Polyolefins, S. van der Ven, Chapter 6, pages 289-293 and 316-329, 1990
D33: Declaration of G. Ferraro, dated 19 June 2019
D40: Declaration of G. Ferraro, dated 7 January 2021
D41: ISO 16152:2005(E), First edition, 2005-07-01
D45: Declaration of A. Riemma, dated 10 September 2021
D47: WO 01/36502 A1

III. As far as relevant to the present case, the following conclusions were reached in the decision under appeal:

- Document D47 was admitted into the proceedings;

- The main request was admitted into the proceedings;

- The objections of lack of novelty raised against the main request were rejected.

- The subject-matter of the claims of the main request involved an inventive step when example 1 of document D6 was taken as the closest prior art.

For these reasons, the patent amended on the basis of the main request was held to meet the requirements of the EPC.

IV. Opponent 2 (appellant) lodged an appeal against that decision.

V. Opponents 1 also filed an appeal which they withdrew with letter dated 1 April 2022.

VI. With their rejoinder to the statement of grounds of appeal, the patent proprietor (respondent) filed *inter alia* two sets of claims as 1st and 2nd auxiliary requests.

VII. The parties were summoned to oral proceedings and a communication indicating specific issues to be discussed at the oral proceedings was then sent to the parties.

VIII. Oral proceedings were held on 19 April 2024 in the presence of the sole remaining appellant (opponent 2) and the respondent, as announced.

IX. The **final requests** of the parties were as follows:

(a) The appellant requested that the decision under appeal be set aside and that the patent be revoked.

(b) The respondent requested that the appeal be dismissed (main request) or, in the alternative, that the decision under appeal be set aside and the patent be maintained in amended form according to the claims of one of the 1st or the 2nd auxiliary requests filed with their rejoinder to the statement of grounds of appeal.

(c) No requests were on file from the parties as of right (opponents 1 and opponent 3).

X. Claim 1 of the **main request** read as follows

"1. A propylene polymer composition comprising

(A) 68 to 90 wt% of a crystalline isotactic propylene homopolymer matrix having a pentad regularity as determined by ^{13}C-NMR spectroscopy of more than 96 mol% and a matrix melt flow rate (MFR_M) as determined at 230°C and 2.16 kg load according ISO 1133 in the range of 0.5 to 500 g/10min,

(B) 10 to 32 wt% of a predominantly amorphous propylene copolymer with 28 to 50 wt% of ethylene and/or an α-olefin with 4-10 carbon atoms being present in the composition as dispersed particles, and

(C) optionally 0.5 to 10 wt% of a crystalline ethylene copolymer with an α-olefin with 3-10 carbon atoms being present in the composition as inclusions of the dispersed particles of (B),

said composition being further characterized by a total melt flow rate (MFR_T) as determined at 230°C and 2.16 kg load according ISO 1133 in the range of 6.0 to 200 g/10min, a fraction soluble in xylene (XCS)

determined at 25°C according ISO 16152 in the range fro m 17.0 to 25.0 wt%, and an intrinsic viscosity of the XCS fraction as measured according to DIN ISO 1628/1 in decalin at 135°C is in the range of 2.0 to below 4.0 dl/g,

the propylene polymer composition further characterized by at least two glass transition points (T_g) as determined by dynamic-mechanical thermal analysis according ISO 6721-7, with one T_g ($T_g(1)$) associated to the crystalline isotactic propylene homopolymer matrix being in the range of -4 to 4°C and another T_g ($T_g(2)$) associated to the predominantly amorphous propylene copolymer being in the range of -65 to -50°C

wherein further the propylene polymer composition is characterized by a puncture energy (23°C) as determined in the instrumental falling weight (IFW) test according to ISO 6603-2 using injection moulded plaques of 60x60x2 mm at +23°C and a test speed of 2.2 m/s of at least 20 J and fulfilling the inequation

Puncture Energy (23°C) > 80-20*iV(XCS)

wherein iV(XCS) is the intrinsic viscosity of the XCS fraction as measured according to DIN ISO 1628/1 in decalin at 135°C,

wherein still further the propylene polymer composition has a crystalline polypropylene content with a melting point (T_m) from DSC analysis according ISO 11357 in the range of 160 to 170°C with an associated melting enthalpy (H_m) in the range of 70 to 100 J/g,

wherein still yet further the propylene polymer composition is produced by visbreaking a polymer

composition from a sequential multi-reactor polymerization process having an initial total melt flow rate (MFR_R) as determined at 230°C and 2.16 kg load according ISO 1133 in the range of 0.5 to 50 g/10min in a melt mixing process with peroxide to a total melt flow rate (MFR_T) with a visbreaking ratio VB defined as

$$VB = MFR_T/MFR_R$$

and said VB being in the range of 1.5 to 30.".

XI. Claim 1 of the **1st auxiliary request** differed from claim 1 of the main request in that the following features were added at the end of the claim:

"wherein the sequential multi-reactor polymerization process is conducted in the presence of

a) a Ziegler-Natta catalyst comprising compounds (TC) of a transition metal of Group 4 to 6 of IUPAC, a Group 2 metal compound and an internal donor, wherein said internal donor is a citraconate;

b) a co-catalyst (Co), and

c) optionally an external donor (ED).".

XII. The **2nd auxiliary request** is not relevant for the present decision.

XIII. The appellant's arguments, in so far as they are pertinent for the present decision, may be derived from the reasons for the decision below. They are essentially as follows:

The subject-matter of claim 1 of the main request did not involve an inventive step when document D6 was taken as the closest prior art.

XIV. The respondent's arguments, in so far as they are pertinent for the present decision, may be derived from the reasons for the decision below. They are essentially as follows:

The subject-matter of claim 1 of the main request involved an inventive step when document D6 was taken as the closest prior art.

XV. None of the parties as of right made any submissions during the appeal proceedings.

Reasons for the Decision

Main request

1. The operative main request is the main request on which the decision under appeal is based. The appellant contested the decision of the opposition division regarding inventive step of claim 1 of that main request when document D6 was taken as the closest prior art. In that respect, the respondent withdrew during the oral proceedings before the Board their objection that several lines of arguments put forward by the appellant in appeal be not admitted (rejoinder: points 47 to 50 and 83; minutes: page 2, fourth paragraph, second sentence). Therefore, the question of the admittance of these arguments does not arise and all the arguments put forward by the appellant are to

be considered in the present decision.

2. Inventive step

2.1 Closest prior art

The appellant and the respondent both agreed with the opposition division that D6 was a suitable document to be taken as the closest prior art. It was also common ground that example 1 of D6 was particularly relevant and could be taken as the starting point for the analysis of inventive step. The Board has no reason to deviate from these views.

2.2 Distinguishing feature(s)

2.2.1 In the following, the features of claim 1 of the main request will be referred to using the following numbering:

(1)	A propylene polymer composition comprising
(2)	68 to 90 wt% of a crystalline isotactic homopolymer matrix
(2.1)	having a pentad regularity as determined by ^{13}C-NMR spectroscopy of more than 96 mol%
(2.2)	and a matrix melt flow rate (MFR_M) as determined at 230°C and 2.16 kg load according ISO 1133 in the range of 0.5 to 500 g/10min,
(3)	10 to 32 wt% of a predominantly amorphous propylene copolymer [3.1] being present in the composition as dispersed particles
(3.1)	[with 28 to 50 wt% of ethylene and/or an α-olefin with 4-10 carbon atoms]
(4)	optionally 0.5 to 10 wt% of a crystalline ethylene copolymer [4.1] being present in the composition as inclusions of the dispersed particles of (B)
(4.1)	[with an α-olefin with 3-10 carbon atoms]

(5)	said composition being further characterized by a total melt flow rate (MFR_T) as determined at 230°C and 2.16 kg load according ISO 1133 in the range of 6.0 to 200 g/10min,
(6)	a fraction soluble in xylene (XCS) determined at 25°C according ISO 16152 in the range from 17.0 to 25.0 wt%, and
(7)	an intrinsic viscosity of the XCS fraction as measured according to DIN ISO 1628/1 in decalin at 135 °C is in the range of 2.0 to below 4.0,
(8)	the propylene polymer composition further characterized by at least two glass transition points (T_g) as determined
	by dynamic-mechanical thermal analysis according ISO 6721-7
(8.1)	with one T_g ($T_g(1)$) associated to the crystalline isotactic propylene homopolymer matrix being in the range of -4 to 4°C and
(8.2)	another T_g ($T_g(2)$) associated to the predominantly amorphous propylene copolymer being in the range of -65 to -50°C
(9)	wherein further the propylene polymer composition is characterized by a puncture energy (23°C) as determined in the instrumental falling weight (IFW) test according to ISO 6603-2 using injection moulded plaques of 60x60x2 mm at +23 °C and a test speed of 2.2 m/s of at least 20 J and fulfilling the inequation Puncture Energy (23°C) > 80 – 20*iV(XCS) wherein iV(XCS) is the intrinsic viscosity of the XCS fraction as measured according to DIN ISO 1628/1 in decalin at 135 °C
(10)	wherein still further the propylene polymer composition has a crystalline polypropylene content with a melting point (T_m) from DSC analysis according ISO 11357 in the range of 160 to 170°C
(10.1)	with an associated melting enthalpy (H_m) in the range of 70 to 100 J/g
(11)	wherein still yet further the propylene polymer composition is produced by visbreaking a polymer composition from a sequential multi-reactor polymerization process having an initial total melt flow rate (MFR_R) as determined at 230°C and 2.16 kg load according ISO 1133 in the range of 0.5 to 50 g/10min in a melt mixing process with peroxide to a total melt flow rate (MFR_T) with a visbreaking ratio VB defined as $VB = MFR_T / MFR_R$ and said VB being in the range of 1.5 to 30.

2.2.2 The appellant and the respondent both agreed with the opposition division that the subject-matter of claim 1 of the main request differed from the propylene polymer composition according to example 1 of D6 at least in that it was visbroken, as defined by the product-by-process feature of operative claim 1 (decision under appeal: point 7.5 of the reasons, in particular the passage thereof on page 19; statement of grounds of appeal: second paragraph of the section on inventive step; rejoinder: point 40). Said undisputed distinguishing feature, which will be referred to hereinafter as "the product-by-process feature of claim 1", corresponds to feature 11 of the table contained in point 2.2.1 above.

2.2.3 The respondent put forward that the subject-matter of claim 1 of the main request additionally differed from the disclosure of example 1 of D6 in the specific values of Tg, puncture energy/iV(XCS) and DSC measurements indicated therein (features 8 to 10.1 as defined in the table of point 2.2.1 above). In the respondent's view, since there was no evidence on file that the rework of example 1 of D6 made in D33/D40/D45 satisfied the essential requirements of D6 in terms of Mw/Mn, Mz/Mw and TREF profile, it could not be concluded that said rework constituted a fair reproduction of example 1 of D6 (rejoinder: sections 37-39). That view was further confirmed by the fact that the same value of XCS content (feature 6 of the table of point 2.2.1 above) had been determined in D33/D40 as in D6, although a different measurement method had been used, so the respondent (rejoinder: section 38).

a) However, as pointed out by the appellant (letter of 31 October 2022: page 2, second and third paragraphs),

all these arguments of the respondent were already rebutted by the opposition division on the basis of the following arguments (reasons: page 18, first to penultimate paragraphs):

(i) In view of the overwhelming correspondence of the parameters between D6 and D33/D40/D45, the data in the latter documents reflected the correct repetition of example 1 of D6;

(ii) It could not be excluded that, in the present case, different determination methods of XCS may lead to the same result.

b) Regarding argument (i), the Board concurs with the appellant (letter of 31 October 2022, page 2, fourth paragraph) that the mere absence of information in D33/D40/D45 regarding some features that define the invention according to D6 (e.g. the polydispersity of fraction (A) or the specifics of the TREF profile defined in claim 1 of D6) or which were used to characterise the polymer composition prepared in example 1 of D6 (see table 2) is not sufficient to cast doubt that the rework of example 1 of D6 that was carried out in D33/D40/D45 is a fair reproduction of the disclosure of that example, contrary to the respondent's view (rejoinder: point 37; letter of 23 January 2023: points 9-10). In particular, it is explicitly stated in point 4 of D33 that example 1 of D6 was repeated by following the procedure described in that document from page 15, line 13 to page 16, line 19, which passage of D6 discloses the catalyst system and the polymerisation process that was used to carry out example 1 of D6. Therefore, in the absence of any evidence to the contrary, there is no reason to consider that the process carried out in D33/D40/D45

differed from the one according to example 1 of D6. In that respect, it was further not shown by the respondent that it would be possible to prepare, using a catalyst system and process conditions as disclosed in example 1 of D6, a polymer composition that satisfies the features in common between D6 and D33/ D40/D45 (namely the features indicated in the first paragraph on page 18 of the decision under appeal) but that does not meet other features explicitly disclosed in D6 (but not in D33/D40/D45).

c) Regarding argument (ii), the respondent essentially argued that the cooling regime used in the method according to the patent in suit (ISO standard according to D41) and in D6 were different, which would be expected to lead to different results, in particular when considering the teaching of point 5.3.10 of D41 (respondent's letter of 23 January 2023: points 4-8). However, the respondent's arguments are not supported by any evidence and remain, in the Board's view, speculative. In particular, it was not shown that the difference in cooling regime identified by the respondent was such that different results in terms of XCS content must be obtained, let alone in the specific case of the propylene composition prepared according to example 1 of D6.

2.2.4 During the oral proceedings before the Board, the respondent indicated that the first rework of example 1 of D6 that had been filed by the appellant during the opposition proceedings, namely D33, had to be complemented by D40 and D45 in order to allegedly show that all the features of claim 1 of the main request were met. In addition, according to the respondent, the value of 17.8 wt% of the fraction soluble in xylene (XCS) determined for said rework (D33: table of

point 5) was very close to the lower limit of the range defined for that feature in claim 1 of the main request ("from 17.0 to 25.0 wt%"). Under such circumstances, the respondent considered that the rework of example 1 of D6 made in D33/D40/D45 did not constitute a direct and unambiguous disclosure of the subject-matter according to claim 1 of the main request, in particular of the XCS feature.

However, the Board is satisfied that, as explained by the appellant, the original information given in D33 had to be complemented by the one given in D40 and D45 in order to react to objections raised by the respondent against D33 and/or in order to address features that had been added to the claims of the operative main request defended by the patent proprietor in the course of the opposition proceedings. Therefore, the circumstances of the present case justify that D33 had to be complemented due to the development of the proceedings.

In addition, the Board agrees with the appellant that the value of 17.8 wt.% for the XCS fraction determined for the rework of example 1 of D6 (see D33: table in point 5) is i) according to the disclosure of example 1 of D6 (table 1: xylene insoluble fraction is 82.2 wt.%, which means that the xylene soluble fraction is 17.8 wt.%), ii) significantly higher that the lower end and iii) significantly smaller than the higher end of the range defined for that feature in claim 1 of the main request (17.0 wt% and 25.0 wt%, respectively). Under these circumstances, it can be concluded in view of the evidence on file that the requirement in terms of the fraction soluble in xylene defined in claim 1 of the main request (feature 6 defined in the table of point 2.2.1 above) is met by the composition prepared

in the rework of example 1 of D6 according to D33/D40/D45 as well as all the other features objected to by the respondent.

For these reasons, the respondent's arguments did not convince.

2.2.5 In view of the above, the subject-matter of claim 1 of the main request differs from the disclosure of example 1 of D6 only in terms of its product-by-process feature (feature 11 as defined in the table of point 2.2.1 above).

2.3 Problem effectively solved over the closest prior art

2.3.1 In the decision under appeal, the opposition division considered that in view of some of the examples of the patent in suit (example 2 *vs*. example 3; example 2 *vs*. example 4; comparative example 2 *vs*. comparative example 4), the problem effectively solved over the closest prior art resided in the provision of a propylene polymer with improved mechanical properties, in particular impact performance (reasons: page 20, last paragraph to page 21, fourth paragraph).

2.3.2 Whereas the respondent adhered to that formulation - thereby putting more weight on an improvement in terms of low temperature (-20°C) puncture energy - (rejoinder: point 99), the appellant formulated the problem solved as to reside in the provision of a mere alternative composition having good flowability and stiffness in combination with good impact performance (statement of grounds of appeal: page 4, fourth paragraph).

2.3.3 In that respect, the Board agrees with the opposition division that it is derivable from table 1 of the patent in suit that the preparation of the propylene polymer compositions of examples 2 and 3 of the patent in suit was the same, with the exception that the composition of example 2 was submitted to visbreaking as defined in operative claim 1, while the composition of example 3 was not (paragraphs 172-175 and table 3 of the patent in suit). Also, both compositions were nucleated. Therefore, in the absence of any evidence or arguments to the contrary, it is agreed with the opposition division that the compositions prepared in examples 2 and 3 according to table 3 of the patent in suit only differ in terms of the distinguishing feature identified in section 2.2.5 above.

2.3.4 Regarding the technical effect achieved by said distinguishing feature, it is derivable from table 3 of the patent in suit that the visbroken composition of example 2 exhibits - as compared to the non-visbroken composition of example 3 - improved flowability (higher melt flow rate "MFR_2") as well as improved puncture energy both at 23°C and, even more, at -20°C, as put forward by the respondent (patent in suit: page 19, lines 45-47; page 20, lines 14-16).

a) In that respect, the fact that visbreaking leads to increased flowability was common ground and is further a necessary consequence of the requirement in claim 1 of the main request that feature VB must be above 1.5 (see feature 11 in the table of point 2.2.1 above), i.e. the melt flow rate must increase (which means that flowability increases) upon visbreaking.

b) However, the main point of dispute between the parties was whether or not the problem to be solved

could be formulated considering an improvement in terms of low temperature puncture energy. It is therefore analysed in the following why the Board came to the conclusion that such an improvement can be acknowledged.

2.3.5 The appellant argued that the improvement in terms of low temperature puncture energy relied upon by the respondent was not valid because the effect shown was not related to the visbreaking step but rather to a reduction in terms of intrinsic viscosity of the xylene soluble fraction "iV(XCS)" (statement of grounds of appeal: page 2, first paragraph to page 4, first paragraph).

Although it is correct that the value of iV(XCS) of example 2 reported in table 3 of the patent in suit is lower than the value of iV(XCS) of example 3 (page 20, line 9), it remains that an improvement in terms of puncture energy does exist at 23°C and even more so at -20°C (rejoinder: points 57-64). The appellant's view that the figure on page 2 of their statement of grounds of appeal showed that puncture energy and iV(XCS) were inversely correlated regardless of visbreaking is not convincing because, from the datapoints shown on that figure, only IE3 and IE2 are effectively related to the above identified distinguishing feature, as noted by the respondent (rejoinder: point 55). That view, which was communicated to the parties in the Board's communication (point 6.3.4), was not disputed any further by the appellant, in particular at the oral proceedings before the Board.

2.3.6 The appellant further argued that the improvement relied upon by the respondent could not be taken up in the formulation of the problem effectively solved over

the closest prior art because it had not been shown to be satisfied over example 1 of D6 (letter of 31 October 2022: page 3, sixth paragraph to middle of page 4).

a) In that respect, it is agreed with the appellant that there is no evidence on file that allows to conclude that the composition prepared in example 3 according to table 1 of the patent in suit (which is not visbroken in table 3 of the patent in suit) is effectively according to the teaching of D6 (no information seems to be available regarding the specifics of the TREF profile and/or the polydispersity of the propylene homopolymer fraction A) as defined in claim 1 of D6). To the contrary, it is derivable from the argumentation put forward by the respondent in respect of the 1st auxiliary request (letter of 23 January 2023: points 52-53) that the catalyst system used in example 3/table 1 of the patent in suit actually differs from the one taught in D6 (see e.g. claim 4 thereof) and would in particular be expected to lead to compositions that may not lead to a molecular weight distribution as taught in D6. Also, that view is supported by the fact that the propylene composition according to example 3/table 3 of the patent in suit exhibits a significantly lower puncture energy at 23°C than the one prepared in the rework of example 1 of D6 (patent in suit: page 20, line 14; D45: point 4). Under these circumstances, it is correct that the comparison of examples 2 and 3 of table 3 of the patent in suit is not directed to a comparison between a composition according to operative claim 1 with a composition according to the closest prior art (example 1 of D6).

b) However, the respondent put forward that since example 3/table 3 of the patent in suit was closer to

example 2/table 3 than example 1 of D6, the improvement in terms of puncture energy relied upon was to be acknowledged (letter of 13 March 2023: point 15).

b1) In that regard, it is correct that, according to established case law (Case Law, *supra*, I.D.4.3.2; see in particular T 35/85: section 4 of the reasons, and T 197/86, OJ EPO 1989, 371: section 6.1.3 of the reasons), the patent proprietor (here, the respondent) may discharge his onus of proof by voluntarily submitting comparative tests with newly prepared variants of the closest state of the art identifying the features common with the invention, in order to have a variant lying closer to the invention so that the advantageous effect attributable to the distinguishing feature is thereby more clearly demonstrated. In that respect, if comparative tests are chosen to demonstrate an inventive step on the basis of an improved effect over a claimed area, care should nevertheless be taken that the nature of the comparison with the closest state of the art is such that the alleged advantage or effect is convincingly shown to have its origin in the distinguishing feature of the invention compared with the closest state of the art.

b2) In the present case, the Board is satisfied that, as already outlined in sections 2.3.3 and 2.3.4 above, the comparison of example 2/table 3 with example 3/ table 3 of the patent in suit shows that the product-by-process feature of operative claim 1 leads to an increase in puncture energy (of the visbroken composition as compared to the non-visbroken composition), in particular at low temperature. Under these circumstances, the Board is satisfied that the respondent made it credible that the above identified distinguishing feature is effectively related to the

technical effect relied upon.

b3) The appellant held that the effect relied upon by the respondent was not allowable because the composition according to example 2 of the patent in suit (according to claim 1 of the main request) did not exhibit a better puncture energy than the composition according to example 1 of D6 that constituted the closest prior art (letter of 31 October 2022: bottom of page 3 to middle of page 4). However, in the present case, the question to be answered when formulating the problem effectively solved over the closest prior art is not if any heterophasic propylene composition according to operative claim 1 exhibits a better puncture energy than the one of the composition according to example 1 of D6, but if the distinguishing feature identified above (the visbreaking product-by-process feature) was convincingly shown to lead to the technical effect claimed by the respondent to be achieved (namely an increase in puncture energy as compared to the non-visbroken composition). In the present case, the Board is satisfied that, in view of the evidence on file, it is credible that the positive effect of visbreaking on puncture energy shown on the composition according to example 3 of the patent in suit would also be obtained on the composition according to example 1 of D6 which constitutes the closest prior art.

c) For that reason, the appellant's argument is not persuasive.

2.3.7 The appellant argued that the effect on low temperature puncture energy should not be considered for the formulation of the problem solved over the closest prior art because that property was not a requirement

of claim 1 of the main request (appellant's letter of 16 February 2024: page 2, end of third paragraph as well as fifth and sixth paragraphs; the argument was further developed at the oral proceedings before the Board).

In that regard, since the Board considers that the improved low temperature puncture energy due to visbreaking relied upon by the respondent is demonstrated by examples 2 and 3 of the patent in suit, that effect can be taken up in the formulation of the problem effectively solved over the closest prior art and there is no need to mention it in the claims.

2.3.8 The appellant further considered that the effect of improved low temperature puncture energy was not credible over the whole scope of the claims, in particular because that effect was at most illustrated by a single comparison of examples of the patent in suit (examples 2 and 3). However, considering that it was derivable from e.g. D47 that the effect of visbreaking depended on the material being visbroken, it was not credible that the effect shown in examples 2 and 3 of the patent in suit could be generalised over the whole scope of operative claim 1 (appellant's letter of 16 February 2024: page 3, third to seventh full paragraphs; the argument was further developed at the oral proceedings before the Board). That view was further confirmed by the arguments put forward by the respondent in support of inventive step of claim 1 of the 1st auxiliary request and according to which the catalyst system used to prepare the compositions being claimed was special. Also, this was in line with the fact that there was no requirement for visbreaking to be applied in the application as filed or claim 1 as granted and that the majority of the examples as filed

did not use visbreaking but did nevertheless obtain all other required features of the claims as granted, so the appellant (letter of 31 October 2022: page 5, second paragraph, passage in brackets; letter of 16 February 2024: page 4, second and third paragraphs).

a) However, considering that examples 2 and 3 of the patent in suit were shown to demonstrate an improvement in terms of low temperature puncture energy over the closest prior art, it would have been the duty of the appellant to provide evidence to the contrary in order to refute the presumption created by the patent in suit, e.g. by showing that said improvement was not achieved over the whole scope of claim 1 of the main request. In the absence of such evidence, the appellant's argument cannot succeed.

b) Regarding the disclosure of D47, the Board considers that it is derivable from the passages on pages 2 and 3 thereof that the visbreaking of polypropylene heterophasic copolymer may be expected to be in some cases problematic ("is more complicated", "will cause problems", "flow problems, or gels") and even may lead to disadvantages ("The mechanical properties, both stiffness and impact, drop"): in view of this, the Board shares the appellant's view that the effect of visbreaking on (low temperature) puncture energy would be expected to depend on the nature of the polypropylene heterophasic copolymer and/or of the catalyst used for its preparation. However, in the present case, the composition according to claim 1 of the main request is defined in terms of both its constituents, i.e. by structural features (point 2.2.1 above: features 2 to 4.1) and by a combination of parameters defining requirements to be met by that composition or by components thereof, i.e. by several

parameters/functional features (point 2.2.1 above: features 5 to 11). Under such circumstances, it is considered that said specific combination of features strongly and effectively limits the definition of the polypropylene heterophasic copolymer. Therefore, in the absence of any evidence to the contrary, the Board is satisfied that the combination of structural and functional features defined in operative claim 1 implicitly limits the definition of the compositions being claimed to an extent for which, in view of the evidence on file, it is credible that the effect(s) achieved by examples 2 and 3 of the patent in suit may be expected to be achieved. In other words, there are no reasons to consider that the effect shown by examples 2 and 3 cannot be generalised to those compositions being defined in claim 1 of the main request.

c) The Board is further satisfied that the conclusion reached in the preceding paragraph is not affected by the arguments put forward by the respondent in support of claim 1 of the 1st auxiliary request, in which the compositions being claimed are further limited by the definition of the catalyst system used (which should in particular contain a citraconate as internal electron donor), for their preparation (see section XI above). Indeed, such a definition of the catalyst system was intended to further distinguish the compositions being claimed from the ones disclosed in the prior art (rejoinder: point 119). However, the line of argument put forward by the respondent regarding inventive step in that regard was that the examples of the patent in suit showed that the amendment made in respect of the definition of the catalyst system allowed the puncture energy/iV(XCS) relationship defined in claim 1 of the main request (point 2.2.1 above: feature 9) to be

fulfilled, which was not mandatorily the case when catalyst systems containing different electron donors (phthalates vs. citraconates) were used (rejoinder: points 121-128). Therefore, the respondent's argument is not that the puncture energy/iV(XCS) relationship defined in claim 1 of the main request can only be obtained when a catalyst system as defined in claim 1 of the 1st auxiliary request is used. Rather, the respondent's argument is that not all catalyst systems of the prior art allow to satisfy the puncture energy/ iV(XCS) relationship defined in claim 1 of the main request. It is further noted that that conclusion is confirmed by the fact that comparative examples 2 and 4 of the patent in suit show that an increase in low temperature puncture energy may also be obtained using a catalyst system not according to the one defined in claim 1 of the 1st auxiliary request (table 4, whereby comparative example 4 was obtained by visbreaking the composition of comparative example 2, as indicated in paragraph 172; comparative example 2 was obtained using a phthalate electron donor in the catalyst system as indicated in paragraphs 165-166; none of comparative examples 2 and 4 however satisfies a.o. the puncture energy/iV(XCS) relationship defined in claim 1 of the main request: patent in suit, page 21, lines 5-7). Under these circumstances the line of argument put forward by the respondent in respect of inventive step for the 1st auxiliary request does not justify that the improvement in low temperature puncture energy relied upon by the respondent in view of examples 2 and 3 of the patent in suit cannot be held to be credible for all the compositions defined in claim 1 of the main request.

d) The Board is also satisfied that the provision of compositions exhibiting high flowability together with

a good balance of puncture energy, impact strength and stiffness was an aim of the patent in suit (see e.g. paragraphs 9, 12) and that the improvement in terms of low temperature puncture energy upon visbreaking was shown to be achieved by examples 2 and 3 of the patent in suit, respectively of the application as filed. Therefore, the appellant's view that the selection of "improved low temperature puncture energy" as the objective technical problem was based on a biased selection (since it was not based on anything described as important in the application as filed), which clearly favoured the patent proprietor/respondent, is rejected.

2.3.9 The appellant further noted that while examples 2 and 3 might show that an improvement in terms of low temperature puncture energy was achieved upon visbreaking, they also showed that simultaneously other properties, including another impact property such as Charpy Notched impact at room temperature or low temperature, were significantly deteriorated (letter of 16 February 2024: page 4, sixth to eighth paragraphs; the argument was further developed at the oral proceedings before the Board). Under these circumstances, it should not be permitted to allow the respondent/patent proprietor to formulate the problem solved over the closest prior art on the sole advantageous property while disregarding the other - disadvantageous - ones.

In that regard, it is correct that it was common ground, in particular at the oral proceedings before the Board, that examples 2 and 3 of the patent in suit showed that, upon visbreaking, properties such as stiffness and Charpy impact strength were somewhat deteriorated but remained at an acceptable level for

usual applications (see features flexural modulus "FM ISO 178" and Charpy Notched impact Strength "NIS ISO 179 1eA" in table 3 of the patent in suit; see also the definition of these features in paragraphs 155 and 156 of the patent in suit). However, in the present case, it was neither shown, nor even argued by the appellant that all the properties mentioned by the parties (stiffness, impact strength, low temperature puncture energy) would only be considered to be relevant by the skilled person when taken in combination. In addition, it is derivable from the patent specification that the compositions being claimed may be used for various applications, in particular for making films, extruded, blow moulded or injection moulded articles such as pouches and bags, transport packaging and thin-wall packaging containers, household articles as well as components for car exteriors and interiors, like dashboards, door claddings, consoles, bumpers and trims (paragraphs 1, 14 and 125). In that respect, the Board is satisfied that these different applications may be expected to need to satisfy different requirements (see e.g. paragraph 2 of the patent in suit), whereby it may be useful for certain specific applications to improve in particular (low temperature) puncture energy while other properties (e.g. stiffness, impact strength) are not particularly relevant as long as they are not significantly deteriorated. In particular, the respondent's argument put forward during the oral proceedings before the Board that low temperature puncture energy (while maintaining Charpy notched impact strength and stiffness at a reasonable level) was particularly relevant for blow moulding applications is credible. For these reasons, the Board concluded that it is in the present case allowable to formulate the problem effectively solved considering an improvement in terms of low temperature puncture energy

while keeping other properties (such as Charpy notched impact strength and/or stiffness) at an acceptable level.

2.3.10 The appellant further held that, since examples 2 and 3 of the patent in suit showed that visbreaking led to a substantial increase in melt flow rate and only to a limited increase in low temperature puncture energy, it would be an equally valid approach to consider the problem to be solved to reside in the provision of an heterophasic propylene polymer composition with an improved melt flow rate, while maintaining good impact properties (letter of 16 February 2024: page 5, first five paragraphs; the argument was further developed at the oral proceedings before the Board).

However, since the Board is satisfied that the comparison of examples 2 and 3 of the patent in suit show that visbreaking as defined in claim 1 of the main request credibly leads to an increase in terms of both flowability and low temperature puncture energy and that these improvements are - in view of the evidence on file - credible over the whole breadth of claim 1 of the main request, it is allowable to formulate the problem on the basis of an improvement of both properties. In particular, for the reasons indicated in section 2.3.9 above, the Board is satisfied that such a formulation is related to a suitable technical problem that a skilled person might desire to solve and is neither artificial, nor technically unrealistic. For these reasons, the appellant's argument did not convince.

2.3.11 The same considerations as the ones outlined above are equally valid if the comparison of comparative examples 2 and 4 and/or examples 2 and 4 of the patent

in suit were to be taken into account as was done by the opposition division. However, these comparisons are, in the Board's view, not as relevant as the one between examples 2 and 3 of table 3 of the patent in suit. Indeed the compositions according to comparative examples 2 and 4 of the patent in suit are not related to a composition satisfying all the other features different from the visbreaking step according to operative claim 1. Also, the composition according to example 4/table 1 of the patent in suit differs from the one of example 2/table 1 in that the matrix exhibits a significantly higher melt flow rate. Therefore, no fair comparison may be made between these examples in order to assess if the product-by-process feature of claim 1 leads to any technical effect. That view, which was communicated to the parties in the Board's preliminary considerations of the case (see point 6.3.7 of the communication) was not questioned by the parties, in particular at the oral proceedings before the Board.

2.3.12 In view of the above, the problem effectively solved over the closest prior art resides in the provision of a heterophasic propylene polymer composition with improved flowability and improved low temperature puncture energy, while maintaining impact strength and stiffness at an acceptable level.

2.4 Obviousness

2.4.1 The question remains to be answered if the skilled person, desiring to solve the problem(s) identified in point 2.3.12 above, would, in view of the closest prior art, possibly in combination with other prior art documents or with common general knowledge, have modified the disclosure of the closest prior art in

such a way as to arrive at the claimed subject matter. Therefore, the question arises if the skilled person would have contemplated visbreaking the composition prepared in example 1 of D6 with the aim of increasing the flowability and the puncture energy.

2.4.2 In that respect, the respondent argued that in view of the teaching of D6 regarding the requirement that the matrix component should exhibit a broad molecular weight distribution, the skilled person would not even contemplate visbreaking the composition prepared in example 1 thereof since visbreaking was known to lead to a narrowing of the molecular weight distribution (rejoinder: points 108-111).

a) However, since the polydispersity index of fraction (A) of the composition prepared in example 1 of D6 (value of "6" indicated in table 2) is above the lower end of the range of polydispersity index specified in claim 1 of D6 for that fraction ("4.6 to 10"), some reduction in the molecular weight distribution of the composition prepared in example 1 of D6 would still be possible without departing from the overall teaching of D6. Under these circumstances, it cannot be held that the skilled person would exclude visbreaking that composition, contrary to the respondent's view.

b) It is further noted that the melt flow rate of the composition prepared in example 1 of D6 is 21 g/10 min (see table 2). Therefore, as put forward by the appellant (statement of grounds of appeal: page 4, third paragraph from the bottom), it would be possible to carry out a visbreaking stage of that composition that is according to the product-by-process feature according to operative claim 1, whereby the visbroken

composition still satisfies the requirement in terms of melt flow rate also defined therein (feature 5 as defined in the table of section 2.2.1 above). In addition, the appellant's view that it was possible to do so while remaining within operative claim 1 (appellant's letter of 31 October 2022: page 6, first paragraph) was not contested. The Board is further satisfied that, in doing so, the skilled person would expect that good flowability properties would be maintained.

c) For these reasons, it cannot be concluded that the skilled person would disregard visbreaking the composition prepared in example 1 of D6 in view of the disclosure of D6 and common general knowledge related to the effect of visbreaking on molecular weight distribution.

2.4.3 The appellant's objection was based on the combination of the disclosure of example 1 of D6 with the one of D47. In particular, the appellant argued that the subject-matter of operative claim 1 was obvious in view of the disclosure of D47 regarding the beneficial effects of visbreaking, whereby said disclosure of D47 merely reflected common general knowledge (statement of grounds of appeal: page 4, penultimate paragraph to page 5, last paragraph; letter of 31 October 2022: page 5 and first half of page 6).

a) In that regard, the established decisive principle governing the answer to the question as to what a person skilled in the art would have done depends on the result they wished to obtain (T 939/92, OJ EPO 1996, 309: point 2.5.3 of the reasons). In the present case, since the problem to be solved resides in the provision of a composition with improved flowability

and low temperature puncture energy, the subject-matter being claimed can only be obvious if the prior art relied upon provides a hint to carry out a visbreaking step as defined in operative claim 1 to the composition of example 1 of D6 *with the aim to increase both its flowability and its low temperature puncture energy.*

b) In that respect, it was common ground that D6 did not deal with low temperature puncture energy, let alone with an increase. However, the appellant considered at the oral proceedings before the Board that the falling weight impact energy test carried out in D47 at various temperatures, including low temperature according to the patent in suit (D47: page 8, lines 4-8; examples and tables A-D) corresponded to the puncture energy test according to the patent specification. Considering that that statement, which remained undisputed, is in line with both the one made by opponent 1 during the opposition proceedings (decision: page 21, last paragraph) and with the disclosure of paragraph 158 of the patent in suit (reference is made therein to the same standard ISO 6603-2 as in D47), it is considered hereinafter that both tests effectively relate to the same property/technical effect.

c) Although it is undisputed that visbreaking is a usual means generally known by the skilled person to increase the melt flow rate (i.e. to improve flowability), the disclosures of D47 relied upon by the appellant do not teach that visbreaking a heterophasic polypropylene composition would be expected to lead to lower stiffness and slightly higher impact properties, as put forward by the appellant (statement of grounds of appeal: page 4, penultimate paragraph to page 5 second paragraph). Rather, as put forward by the

respondent (rejoinder: points 89-92; respondent's letter of 23 January 2023: point 43), the disclosure on pages 2 and 3 of D47 teaches that the effect of visbreaking of polypropylene heterophasic copolymer may be problematic ("is more complicated", "will cause problems", "flow problems, or gels") and even may lead to disadvantages ("The mechanical properties, both stiffness and impact, drop"). However, it is also derivable from D47 that such disadvantages can be avoided (page 3, lines 29-30; page 4, lines 12-15 and 24-25).

d) The fact that visbreaking of polypropylene heterophasic copolymer may have unexpected effects depending on the nature of said copolymer is further confirmed by the examples of D47 relied upon by both parties at the oral proceedings before the Board.

d1) In particular, whereas low temperature puncture energy often appears to decrease with increasing visbreaking conditions (table A: example A vs. visbroken examples 1-3; table B: example B1 vs. visbroken example 4; table C: example C vs. visbroken example 8), it seems to increase in some instance (table B: example B3 vs. visbroken example 7).

d2) The respondent further noted that, as indicated by the opposition division (decision: page 21, fifth paragraph), it was known in the art that puncture energy increased with iV(XCS), as shown in figure 6.22 of D29A (rejoinder: point 67). However, also in that respect, it is derivable from D47 (table B: example B3 vs. example 7) that this finding does not seem to be always valid.

d3) In view of the above, the examples of D47 show that

no clear and general conclusion seems to be derivable regarding the impact of visbreaking on low temperature puncture energy (and/or iV(XCS)) of a polypropylene heterophasic copolymer.

e) Therefore, no clear conclusions as to the effect of visbreaking on low temperature puncture energy is derivable from the general teaching of D47.

2.4.4 In addition, it was also not shown, nor even argued by the appellant that the skilled person would have been in a situation in which visbreaking was the sole measure that (s)he would have had at their disposition to solve the problem posed in relation to increased flowability (no "one way street" situation according to established case law: see Case Law, I.D.10.8, in particular the passage related to decision T 192/82, OJ 1984, 415). To the contrary, as argued by the respondent during the oral proceedings before the Board, it is derivable from examples 2 and 4 of the patent in suit that an increase in flowability of the composition of the closest prior art could have been obtained without visbreaking but by adjusting the properties of the various components of the polypropylene compositions (components A to C as defined in claim 1 of the main request). However, in doing so, no improvement in terms of low temperature puncture energy was bound to be achieved (see table 3 of the patent in suit, examples 2 and 4). Under these circumstances, the Board is satisfied that the improvement in terms of low temperature puncture energy cannot be seen to constitute a mere "bonus effect" that would have been inevitably achieved by the skilled person because of a lack of alternative measures (other than visbreaking) to improve the flowability of the

composition of the closest prior art.

2.4.5 In view of the above, the appellant's arguments do not justify that the Board overturns the conclusion reached by the opposition division according to which the subject-matter of claim 1 of the main request was not obvious in the light of the cited prior art documents.

2.5 For these reasons, the subject-matter of claim 1 of the main request involves an inventive step in view of D6 as the closest prior art.

3. The appellant confirmed at the oral proceedings before the Board that they had no further objections against the main request.

4. Since the appellant's (sole) objection did not succeed, the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Hampe D. Semino

Decision electronically authenticated