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**Datasheet for the decision  
of 21 October 2009**

**Case Number:** T 1385/07 - 3.3.03

**Application Number:** 99974176.2

**Publication Number:** 1244717

**IPC:** C08F 210/06

**Language of the proceedings:** EN

**Title of invention:**  
Heterophasic copolymers

**Patentee:**  
Borealis Technology Oy

**Opponent:**  
TOTAL PETROCHEMICALS RESEARCH FELUY S.A.

**Headword:**

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**Relevant legal provisions:**  
EPC Art. 54, 56, 83, 84, 123(2)  
RPBA Art. 12(2), 12(4)

**Relevant legal provisions (EPC 1973):**

-

**Keyword:**

"Late submitted material - documents cited on appeal"  
"Admissibility of objection indicated only generally in  
statement of grounds of appeal - no"  
"Maintenance in amended form - yes"

**Decisions cited:**  
T 0381/87, T 0182/89

**Catchword:**

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Case Number: T 1385/07 - 3.3.03

**DECISION**  
of the Technical Board of Appeal 3.3.03  
of 21 October 2009

**Appellant:** TOTAL PETROCHEMICALS RESEARCH FELUY S.A.  
(Opponent) Zone Industrielle C  
BE-7181 Seneffe (Feluy) (BE)

**Representative:** -

**Respondent:** Borealis Technology Oy  
(Patent Proprietor) P.O. Box 330  
FI-06101 Porvoo (FI)

**Representative:** Kador & Partner  
Corneliusstrasse 15  
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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office dated  
9 May 2007 and posted 12 June 2007 concerning  
maintenance of European patent No. 1244717 in  
amended form.

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** M. C. Gordon  
C.-P. Brandt

## Summary of Facts and Submissions

I. Mention of the grant of European Patent No. 1 244 717 with the title "Heterophasic Copolymers" in the name of Borealis Technology Oy in respect of European patent application No. 99974176.2, filed on 12 November 1999 as international application No. PCT/FI99/00942, published as WO 01/36502 A1 on 25 May 2001 was announced on 21 January 2004 (Bulletin 2004/04) on the basis of 9 claims.

Claims 1 and 7 read as follows:

1. A method of preparing a polypropylene heterophasic copolymer with good flow and impact properties, which involves visbreaking a starting polypropylene heterophasic copolymer of which the amorphous rubber, measured as xylene solubles fraction (XS) at room temperature, has an ethylene content, determined as the ethylene content of the acetone precipitated amorphous rubber fraction of the xylene soluble fraction,  $C_2$  of AM, from 20 wt-% to 45 wt-%, and an intrinsic viscosity, determined as the intrinsic viscosity of the acetone precipitated amorphous rubber fraction of the xylene soluble fraction, IV of AM, of 2 dl/g or more.
  
7. A visbroken polypropylene heterophasic copolymer obtainable by the method according to any preceding claim, with a visbreaking ratio,  $MFR_{final}/MFR_{initial}$ , which is  $\geq 2$ .

Claims 2-6 were directed to preferred embodiments of the method of claim 1. Claims 8 and 9 were directed to preferred embodiments of the copolymer of claim 7.

II. A notice of opposition to the patent was filed on 19 October 2004 by Total Petrochemicals Research Feluy S.A.

The opponent invoked the grounds of opposition pursuant to Art. 100(a) EPC (lack of novelty, lack of inventive step).

The following documents were, *inter alia* cited in support of the opposition:

F1: EP-B1-208 330

F5: US-A-5 258 464.

III. By a decision announced orally on 9 May 2007 and issued in writing on 12 June 2007 the opposition division held that the patent could be maintained in amended form on the basis of a set of 6 claims, filed during the oral proceedings before the opposition division as the (sole) auxiliary request. Claim 1 thereof differed from claim 1 of the patent as granted in that:

- the intrinsic viscosity of the acetone precipitated amorphous rubber fraction of the xylene soluble fraction, ("IV of AM") was restricted to the range 2.5 - 4.5 dl/g;
- the ethylene content of the acetone precipitated amorphous rubber fraction of the xylene soluble fraction ("C<sub>2</sub> of AM") was restricted to 20 to 40 wt%;
- the following phrase had been added to the end of the claim:  
"..wherein the polypropylene heterophasic copolymer is prepared in a two stage polymerization process by using in the second stage a comonomer ratio (CR) (mol/mol) of ethylene to propylene in the range of from 0.25 to 0.7."

Claims 2, 3, 4 and 5 of this request corresponded to claims 4, 5, 6 and 7 of the patent as granted.

Claim 6 read as follows:

"The visbroken polypropylene heterophasic copolymer according to claim 5, with a visbreaking ratio, which is at least 3."

(a) *Main request:*

(i) *Art. 54 EPC*

According to the decision the subject-matter of claim 1 of the main request, i.e. the patent as granted was not anticipated by the disclosure of F1.

F1 disclosed a method for production of a heterophasic copolymer including a method for visbreaking. In examples 25-30 and comparative example 16 of F1 propylene polymers were prepared wherein in a first and second stage propylene homopolymer was prepared and in the third stage a propylene-ethylene copolymer was prepared, which copolymer was considered to correspond to the rubbery phase of the heterophasic copolymer of the patent in suit. The so produced polymers were then subjected to visbreaking.

In Table 5 of F1 the values for the intrinsic viscosity (measured in tetralin at 135°C) and the ethylene content were explicitly listed for the third stage copolymer. The intrinsic viscosity was determined for the total polymer, reference being made to page 3 line 52 of F1. The ethylene ("Et") content was determined by IR spectroscopy.

In contrast the parameters indicated in claim 1 of the main request referred to the xylene solubles fraction. There was no proof that in F1 only a rubbery phase would have been formed (i.e. that in F1 the third stage product would be entirely xylene soluble). Accordingly it could not be concluded with

certainty that the parameters as given in the patent and those reported in F1 had been determined on the same or comparable fractions.

(ii) *Art. 56 EPC*

The objective technical problem in the light of closest prior art F5 was formulated as being the provision of an alternative method of preparing heterophasic polypropylene resins resulting in high flowability and good low temperature impact properties. This problem was solved according to claim 1 of the main request by using as the starting polymer a polypropylene heterophasic copolymer having selected ranges with respect to the intrinsic viscosity and the ethylene content in the xylene soluble fraction. These were considered to be arbitrary selections from the teachings of F5 as the working examples of the patent in suit did not demonstrate the criticality of these parameters.

Consequently the subject-matter of the main request did not involve an inventive step.

(b) *Auxiliary request*

(i) *Art 123(2) EPC*

It was held that the subject-matter introduced into claim 1 found support at original claims 2 and 3 and on page 1, lines 10-21, page 5 lines 25-30 and page 7, lines 3-4 of the application as filed. It was further held that the features, disclosed at page 7 lines 3-4, of an appropriate catalyst and the preferred comonomer ratio range were

separate features and not closely connected with each other. Accordingly the requirements of Art. 123(2) EPC were satisfied.

(ii) *Art. 83 EPC*

The minutes of the oral proceedings before the opposition division record that during the course of the discussions of the first auxiliary request the opponents raised an objection pursuant to Art. 83 EPC in respect of the specified comonomer ratio since it was not disclosed how to obtain the specified C<sub>2</sub> content. It is recorded that the patent proprietor objected that this was not one of the grounds of opposition raised. The opposition division admitted this objection in respect of the newly filed claims.

According to the decision it was within the normal routine of the skilled person in the olefin polymerisation field to select the commoner ratio as well as the appropriate catalyst in order to arrive at the desired product using the information given in the specification (several working examples) together with general knowledge.

(iii) *Art. 84 EPC*

With respect to Art. 84 EPC and an objection that the term "stage" introduced into claim 1 was used with a different meaning than in F1 and therefore rendered the claim ambiguous, the opposition division held that the claim together with paragraphs [0003], [0026] and [0028] of the description was



clear. The matrix polymer was formed in the first stage, which could be done in one or more reactor(s). In the second stage the rubbery phase was polymerised in the matrix polymer, which could be done in one or more gas phase reactor(s).

(iv) *Art. 54 EPC*

It was noted that claim 1 of the auxiliary request was of narrower scope than the main request. Accordingly novelty was acknowledged.

(v) *Art. 56 EPC*

It was held that the objective problem was the same as in the case of the main request, i.e. to provide an alternative method of preparing heterophasic polypropylene resins resulting in high flowability and good low temperature impact properties.

An inventive step was recognised with respect to the teaching of F5 since it was credible that the specified ranges of intrinsic viscosity, comonomer ratio and ethylene content were shown by the examples of the patent to be associated with improved impact properties. F5 contained no teaching with respect to these ranges.

Further F1 alone or in combination with one of the other cited documents did not render the subject-matter of claim 1 obvious.

IV. A notice of appeal against this decision was filed by the opponent on 22 August 2007, the prescribed fee being paid on the same day.

V. The statement of grounds of appeal was received on 22 October 2007.

The opponent - now the appellant - raised objections to the amended claims on the grounds of Art. 100(a)-(c) EPC. Art. 84 EPC was also invoked.

(a) *Newly filed documents*

Four documents were cited for the first time in the statement of grounds of appeal:

F12: WO-A-99/02604

F13: WO-A-00/39238

F14: US-A-4 521 566

F15: "Finapro - polypropylene for injection molding", Fina Chemicals, 03/96. It was submitted that this document had been made publicly available with no restrictions.

No explanation or justification was given for the citing of F12-F15 at this stage of the proceedings. It was however stated that F12 and F13 did not disclose the comonomer ratio used in the production of the ethylene-propylene rubber ("EPR") phase.

The statement of grounds of appeal also included an "Annex" relating to measurements of intrinsic viscosities in the solvents decalin and tetralin.

(b) *Art. 123(2) EPC*

It was objected that the comonomer ratio of 0.25 to 0.7 mol/mol had been disclosed in the passage of the application as filed referred to by the opposition division (page 7 lines 3 and 4 - see section III.(b).(i), above) only in combination with the feature "appropriate choice of catalyst". The omission of this feature from amended claim 1

constituted an extension of subject-matter contrary to Art. 123(2) EPC.

(c) *Art. 83 EPC*

Claim 1 as amended in opposition proceedings now contained parameters relating to the product as such as well as to the process for the production thereof:

- the ethylene content of the acetone precipitated amorphous rubber fraction of the xylene soluble fraction was from 20-40 wt% and
- the polypropylene heterophasic copolymer was prepared in a two stage polymerisation process with a comonomer ratio of ethylene to propylene in the range of 0.25 to 0.7 mol/mol.

The specified comonomer ratio corresponded to a weight percentage of ethylene in the range from 14 to 32 wt%.

Thus the skilled person was given the information that in order to obtain an ethylene content of 20-40 wt% it was necessary to perform the polymerisation at a comonomer ratio in the range from 14 to 32 wt%. Apart from the indication that the choice of catalysts had to be "appropriate" the skilled person was left without any guidance, in particular with relation the overall polymerisation conditions.

(d) *Art. 84 EPC*

Although both the claim and the description stated that the comonomer ratio had to be in a certain range, neither disclosed where in the second polymerisation stage this ratio applied. Since a number of alternatives were possible, e.g. the gas

composition in the reactor or the feed streams into the reactor it had to be concluded that the claims were not clear and concise.

(e) *Art. 54 EPC*

F1, relating to heterophasic propylene copolymers and visbreaking thereof disclosed starting copolymers that were produced by a three-stage polymerisation process whereby the production of the rubber phase took place in the third stage. In the patent in suit, the production of the rubber phase was done in the second stage.

The copolymers of the third stage of F1 had an ethylene content in the range of 20 wt% to 65 wt% and an intrinsic viscosity of no less than 2.8 dl/g, preferably 3.0-12 dl/g measured in tetralin at 135°C.

Although F1 did not disclose the comonomer ratio of ethylene to propylene used for the production of the third stage polymer, the appellant submitted recognition of sufficiency of disclosure implied that the ethylene content in the amorphous phase and the comonomer ratio were considered to be equivalent expressions and defined the same thing. Hence in giving the ethylene content for the copolymer of the third stage, F1 also disclosed to the skilled person the comonomer ratio that would have to be chosen to arrive at the respective third stage polymer.

Attention was drawn to examples 19-30 and comparative examples 14-16 of F1 which were submitted to disclose the starting polymers according to operative claim 1, and that these could be degraded by visbreaking.

The appellant/opponent also invoked the late filed F12 and F13 in its submissions on novelty.

(f) *Art. 56 EPC*

The appellant/opponent submitted that F14, filed with the statement of grounds of appeal, related to polypropylene heterophasic copolymers having improved impact strength as well as a method for the production of such copolymers. Consequently F14 belonged to the same technical field as the opposed patent and related to the same technical problem. Consequently F14 was taken as the closest prior art.

In particular it was submitted that F14 disclosed all the features of operative claim 1 with the exception of visbreaking.

In view of the data of the patent in suit, in particular example 3 the only technical effect achieved by visbreaking was to increase the melt flow of the heterophasic copolymer.

This was obvious in view of the prior art, reference being made to F5 which was directed to providing polymers with good low temperature impact resistance and taught that the melt flow of a polypropylene heterophasic copolymer could be increased by visbreaking. Hence the subject matter claimed lacked an inventive step in view of the combination of the teachings of F14 and F5.

Objections were also formulated with respect to the dependent claims.

An objection to the subject-matter specifically of claim 4 were formulated in view of the teachings of F12 in combination with F15.

The appellant/opponent also formulated an objection relying on F12 as the closest prior art.

- (g) It was also submitted that in the case that the Board did not follow the arguments of lack of novelty with respect to F1 that this document would be used in the assessment of inventive step. No arguments pursuant to Art. 56 EPC were however formulated with respect to F1.

VI. The patent proprietor, now the respondent replied with a letter dated 12 March 2008.

(a) *Newly filed documents*

It was requested to disregard the newly filed documents F12-F15 (see section V.(a), above). *Inter alia* the appellant/opponent had failed to give any argument why it had not been possible to file these documents earlier, e.g. in the notice of opposition. Further their relevance was not high. Consequently there was no reason to allow the new documents into the proceedings.

(b) *Art. 123(2) EPC*

It was submitted in the context of the passage on page 7 of the application as filed referred to in the decision (see section III.(b).(i), above) that the choice of catalyst and use of low comonomer ratios did not stand in causal relationship which would require their combined incorporation into claim 1.

(c) *Art. 83 EPC*

It was submitted that the choice of the catalyst was not intimately connected to the specific comonomer ratio as long as the catalyst was "appropriate". Moreover, the examples of the patent in suit clearly showed that comonomer

ratios and ethylene contents within the claimed range could be adjusted by using specific catalysts. Thus the information of the patent specification together with common general knowledge enabled the skilled person to achieve the envisaged result within the whole ambit of the claim without undue difficulty.

(d) *Art. 84 EPC*

The passage at paragraph [0035] of the patent provided clear information that the comonomer feed streams were adjusted to the indicated mol ratios. This was basic knowledge to the skilled person. There was consequently nothing unclear in the disclosure regarding the comonomer ratio.

(e) *Art 54 EPC*

F1 did not make it possible to determine the ethylene content of the amorphous phase of the copolymer obtained in the third stage. Thus the ethylene content reported in F1 did not necessarily correspond to the ethylene content as defined in the patent in suit. Further the intrinsic viscosities reported in F1 related to the total polymer, whereas in the patent in suit it was measured for the amorphous phase of the xylene soluble fraction.

Further it was disputed, with reference to paragraph [0036] of the patent in suit that the comonomer ratio in the second stage polymerisation simply corresponded to the ethylene content in the rubber phase (see section V.(e) above).

(f) *Art. 56 EPC*

It was submitted that the newly cited F14 did not mention a visbreaking step or any parameter of the disclosed high impact strength propylene copolymer

which would be important if the polymer were to be subjected to visbreaking. Accordingly F14 could not be termed a close prior art let alone the closest prior art.

Beyond the fact that F14 related to a polypropylene copolymer having desirable impact strength and comprising a rubbery ethylene-propylene copolymer phase, this document was not closely related to the subject matter of the patent in suit.

Hence the information of F14 did not go beyond the teaching of F1 which supported the request for F14 not to be admitted to the proceedings.

It was the specific finding of the invention of the patent in suit that a limited range for the ethylene content in the amorphous rubber phase of the ethylene-propylene copolymer and a limited range for the intrinsic viscosity of the same phase was necessary when visbreaking a starting polypropylene heterophasic copolymer in order to obtain a final copolymer having good flow and impact properties.

Flowability was not mentioned in F14. However especially for improving the flowability of a heterophasic polypropylene visbreaking was conducted.

Further, F14 apparently already provided a final heterophasic polypropylene having good impact strength; consequently there was no motivation for the skilled person on the basis of this document to conduct a visbreaking step. For this reason, the skilled person would not refer to F5. Hence the combination of F14 and F5 would not be in



accordance with the problem-solution approach.

VII. On 20 July 2009 the Board issued a summons to attend oral proceedings.

VIII. Together with a letter dated 18 September 2009 the respondent/patent proprietor submitted a set of 6 claims as a first auxiliary request, in which the wording "an appropriate catalyst" had been inserted into claim 1 after the phrase "by using in the second stage".

It was announced that a technical expert would attend the oral proceedings and it was requested that the expert be permitted to make oral submissions.

(a) *Newly filed documents*

The request that F12-F15 not be admitted to the proceedings was reiterated. Further it was requested that the annex submitted together with the statement of grounds of appeal not be admitted.

(b) *Art. 123(2) EPC*

It was submitted that the wording "appropriate choice of catalyst" did not represent a technical feature which would limit the scope of the claim. It was the general understanding of the skilled person that an appropriate catalyst should be chosen (see sections III.(b), V.(b) and VI.(b), above).

(c) *Art. 54 EPC*

It was emphasised that the intrinsic viscosity disclosed in F1 could not be compared with that specified in the operative claims (see section VI.(e), above).

(d) *Art. 56 EPC*

It was submitted, with reference to page 3 lines

11/12 and 16/17 of the patent in suit that the object of the invention of the patent in suit was to provide a polypropylene heterophasic copolymer with good flow characteristics and good impact characteristics.

It was difficult to improve the combination of these two properties since good impact properties usually were associated with low flowability. F14 addressed a different problem, namely to improve the impact strength at low temperature and did not mention flow properties. Accordingly F14 did not qualify as the closest prior art. In addition, the polypropylene of F14 contained a crystalline ethylene-propylene copolymer fraction and thus was very different from that claimed. According to the patent in suit the polymers were prepared by visbreaking. However a crystalline polyethylene phase would seriously affect the visbreaking giving negative results.

- (e) It was conceded that F1 could be regarded as the closest prior art. It was however submitted that the teachings of this document would not render the subject matter of the operative claims obvious.

IX. The appellant/opponent filed a further letter dated 2 October 2009.

(a) *Newly filed documents*

It was submitted that the first time that a set of claims had been submitted in which the comonomer ratio was specified was at the oral proceedings before the opposition division. Accordingly the notice of appeal had been the first opportunity for the opponent to take account of this feature

and consequently F12-F15 should be admitted to the procedure.

(b) *Art. 83, 84 EPC*

In the light of the statements by the respondent/patent proprietor in the rejoinder to the statement of grounds of appeal (see sections VI.(c), and (d), above) it was concluded that the comonomer ratio in the feed stream and the amount of ethylene in the heterophasic copolymer were to be seen as directly linked and consequently that the comonomer ratio did not add any distinguishing feature.

(c) *Art. 54, 56 EPC*

The consequence of the foregoing considerations with respect to the comonomer ratio was that the objections of lack of novelty and lack of inventive step were maintained.

X. Oral proceedings were held on 21 October 2009.

(a) *Newly filed documents*

The respondent/patent proprietor submitted that, as acknowledged by the appellant/opponent in the statement of grounds of appeal, neither of F12 and F13 disclosed the comonomer ratio (see section V.(a), above). With regard to the intrinsic viscosity the newly filed documents added nothing compared to the previously cited documents. Further F15, cited only with respect to the subject-matter of claim 4 (see section V.(f), above) also did not disclose the comonomer ratio. The appellant/opponent maintained the request that these documents be admitted. It was submitted the submissions of further documents had been necessitated by the restriction in the properties

of the heterophasic polymers undertaken in the amended claims. Further it was submitted that F14 disclosed the monomer feed ratios.

Following deliberation the Board announced its decision that F14 was admitted to the procedure. F12, F13 and F15 were however not admitted.

(b) *Main request - Art. 123(2) EPC*

The appellant/opponent submitted that page 4 of the application, which did not define an "appropriate choice of catalyst", related to a range of comonomer ratio which excluded the defined end points and a range of the intrinsic viscosity of greater than or equal to 2 dl/g. However the range of intrinsic viscosity now specified in operative claim 1 was disclosed at page 7 of the application mandatorily in combination with a range of the comonomer ratio which included the end points and the feature of an appropriate catalyst.

The respondent/patentee submitted that the reference to the catalyst was not considered to be a limiting technical feature but was merely a general statement. The skilled person would as a matter of course select an "appropriate" catalyst. After deliberation the Board announced its decision that the requirements of Art. 123(2) EPC were satisfied.

(c) *Main request - Art. 83 EPC*

The appellant/opponent submitted that the disclosure of the patent in suit was deficient in that beyond a disclosure that the catalyst and the

conditions were important and a teaching to employ an "appropriate" catalyst it was not taught how to attain the required final ethylene content based on the defined starting monomer ratio.

In order to arrive at the specified product properties it was necessary to select the correct catalyst, the correct comonomer ratio, and the other polymerisation conditions, all of which factors were interdependent. Even with a single catalyst there were a multitude of variables to be considered. Also the disclosure of specific catalysts in the patent in suit only indicated further aspects thereof which had to be optimised. As support for this position reference was made to example 6 of the patent which had a significantly lower intrinsic viscosity of the amorphous phase (AM) than the other examples. This was attributed to the fact that not only the amorphous rubber fraction, but also part of the matrix, in particular short chain polypropylene, was included in the xylene soluble fraction and consequently would also be present in the acetone precipitated part thereof, falsifying the result obtained.

The respondent/patent proprietor submitted that the catalyst was specified both in general terms and with specific embodiments being given in the eight examples. The appellant/opponent had provided no evidence to discharge the burden of proving that it was not possible to repeat the examples. Example 6 showed that a change of the catalyst and polymerisation conditions had an influence on what was produced as the matrix. This demonstrated the multitude of parameters which

influenced the outcome.

The respondent/patent proprietor further submitted that the type of polymer in question was well known. The examples provided a clear starting point enabling the skilled person to obtain the required products, which was the main aspect of Art. 83 EPC.

Further, example 6 was a comparative example which explained why this example demonstrated poorer impact strength of the visbroken product.

The appellant/opponent submitted that this situation with example 6 indicated precisely the point that was being made - one aspect of the polymerisation process was changed with the result that the product no longer fell within the scope of the claim.

After deliberation the Board announced that the requirements of Art. 83 EPC were satisfied.

(d) *Main request - Art 84 EPC.*

The appellant/opponent submitted that it was not stated whether the comonomer ratio feature of related to the feed rates of the monomers or to conditions in the reactor itself.

Further, reference was made to page 6, lines 28-30 of the original application disclosing that the product of the first polymerisation stage was fed to the second reaction zone whereby feeding of additional propylene was optional. This meant that 100% ethylene could be fed into the second polymerisation stage, the comonomer ratio would however depend on how much residual propylene was transferred from the first polymerisation stage, i.e. there were two possible sources of comonomer.

The respondent/patent proprietor submitted, with reference to the technical expert that, in the absence of statements to the contrary, the skilled person would understand this to mean the comonomer ratio in the feed. Regarding the question of feeding residual monomer from the first stage, it was explained that it was possible, based on the contents of the two streams to calculate the ratio of comonomer within the reactor.

After deliberation the Board announced that the requirements of Art. 84 EPC were satisfied.

(e) *Main request - Art. 54 EPC*

The appellant/opponent referred to its written submissions.

Further it was submitted that in example 19 of F1 properties were reported for each stage. Only in the third stage, contributing 10 wt% of the total polymer, was ethylene introduced. The reported final ethylene content was 42 wt%, which manifestly could not refer to the entire final polymer. This showed that the reported data referred to each fraction of the polymer as separated. Furthermore, the skilled person knew that it was impossible to measure the properties of each fraction *in situ* and that it was necessary to carry out a separation.

A similar conclusion had to be drawn on the basis of the reported intrinsic viscosities for each stage.

It thus followed that the values reported in F1

were those of the acetone precipitated fraction: this was the normal way to isolate the rubber and is what would be understood by the skilled person when reading F1.

The respondent/patent proprietor disputed this, submitting that the data reported in Table 5 of F1 related to the total polymer resulting from the third stage of the three stage polymerisation, not to a part thereof isolated by fractionation. It was not stated in F1 that such a fractionation (xylene solution, acetone precipitation) had been carried out. The disclosure on page 4 of D1 did not make clear what had been measured. It was agreed that the value of 42 wt% ethylene reported in the table could only refer to the product of the third stage, but it was submitted that this referred to the entirety of the third-stage product, containing also some crystalline polypropylene and not to a specific, isolated, fraction thereof. Thus the measurement reported in F1 had been carried out on a different fraction from that specified in claim 1 of the patent in suit. For this reason F1 could not be novelty destroying.

After deliberation the Board announced its decision that the subject matter of the claims of the main request met the requirements of Art. 54 EPC.

(f) *Main request - Art. 56 EPC*

The appellant/opponent initially made submissions with respect to example 6 of the patent in suit



(already discussed with respect to Art. 83 EPC - see section X.(c), above). The starting polymer in this example had an intrinsic viscosity below the range specified in operative claim 1. The impact properties of the degradation product thereof were however comparable to those of example 1. This demonstrated that the intrinsic viscosity had no influence on the properties of the degraded product. It was conceded, in response to an objection by the respondent/patent proprietor and an observation of the Board that this was a new argument. It was further submitted that although certain properties, namely melt flow resistance and falling weight impact were comparable, the notched Izod impact strength was much higher in the case of example 1 than example 6. This demonstrated that the matrix in example 6 was more flexible. This also demonstrated that different conclusions as to the quality of the product would be reached depending on which of the impact strength methods was chosen.

The appellant/opponent emphasised the submissions made in the Statement of Grounds of Appeal (see section V.(f), above), namely that F14 was the closest prior art and also disclosed the necessary monomer feed ratios, but did not disclose visbreaking. The only effect of visbreaking was to increase the melt flow, which was taught by F5. The respondent/patent proprietor disputed that F14 was the closest prior art. The objective of the patent in suit was to optimise two properties of the visbroken polymer - i.e. the flow properties and the impact strength. F14 considered only

impact strength, did not address visbreaking and hence was not an appropriate starting point for the analysis of inventive step.

Further the product of F14 was disclosed to be a usable end product and hence there was no incentive to modify this, e.g. by visbreaking. The appellant/opponent dismissed the argument that there was no incentive to seek to further develop or improve the teaching of F14.

- (g) The appellant/opponent referred to its written submission with respect to the intention to use F1 for the assessment of inventive step (Art. 56 EPC) (see section V.(g), above), depending on the outcome of the considerations of novelty on the basis of this document.

The Board noted that no case concerning lack of inventive step with respect to F1 had been presented in the statement of grounds of appeal, and referred in this respect to the Art. 12(2) RPBA.

The appellant/opponent referred to - unidentified - case law of the boards of appeal according to which, it was submitted, it was not possible simultaneously to argue lack of novelty and lack of inventive step on the basis of the same document. Further it was submitted that the respondent/patent proprietor had repeatedly argued against admitting F14 for consideration of inventive step as this was less relevant than F1, meaning that the patent proprietor was inherently acknowledging that F1 should be taken as the closest prior art (cf section VIII.(e), above).

The respondent/patent proprietor emphasised with reference to the Rules of Procedure of the Boards of Appeal that no indication of the reasoning on inventive step starting from F1 had been presented in the statement of grounds of appeal.

- XI. The appellant (opponent) requested that the decision under appeal be set aside and that European Patent No. 1 244 717 be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed; in the alternative that the patent be maintained in amended form on the basis of the set of 6 claims designated "Auxiliary Request 1", filed with the letter dated 18 September 2009.

### **Reasons for the Decision**

1. The appeal is admissible
2. *Late filed documents*
  - 2.1 Together with the statement of grounds of appeal, the appellant/opponent filed four documents (F12-F15) and an "annex" containing experimental results (see section V.(a) above).
  - 2.2 The submission of these documents was objected to by the respondent/patent proprietor (see sections VI.(a), VIII.(a) and X.(a), above).
  - 2.3 In the letter of 2 October 2009 and at the oral proceedings (see sections IX.(a) and X.(a), above), the

appellant/opponent submitted that these documents had been filed to take account of amendments made during the opposition proceeding, specifically the introduction of the comonomer ratio into the claims.

- 2.4 F12 and F13 both relate to heterophasic propylene copolymers. Regarding preparation of the polymers, F12 and F13 refer either to blending of two separately prepared polymers or to sequential polymerisation in a reactor cascade (F12 page 3, last section, F13, page 4 last three paragraphs). Neither of these documents however provides any details of the preparation of the polymers. In particular there is no reference to a comonomer ratio to be employed in the case that a multistage sequential polymerisation is employed.

F15 relates to visbreaking in its application to a specific polypropylene designated by its tradename ("Finapro"). This teaching explains the effect of visbreaking on the polymer both at a molecular level and in terms *inter alia* of the mechanical properties thereof. There is however no reference in F15 to the production of the polymer and consequently no reference to any second polymerisation stage.

- 2.5 Since none of F12, F13 or F15 makes any reference to the feature introduced to the claims during the first instance proceedings, i.e. the comonomer ratio, it is not plausible that these documents were submitted in response to the amendments made. Hence the lateness of these documents is not justified by the explanation given. Further no reason has been advanced which would lead the Board to be able to conclude that these could not have been submitted earlier in the opposition

proceedings. Accordingly pursuant to Art. 114(2) EPC and Art. 12(4) RPBA these documents were excluded from consideration.

- 2.6 Since F14 does contain a reference to the comonomer ratio ("feed ratio" reported in Tables 1-3 and the reference to "introduction ... of an ethylene-propylene mixture in the required ratios" col. 5, line 23-24), the reasons given by the appellant/opponent for citing this document are credible. Accordingly this document was admitted to the proceedings.
- 2.7 The "annex" submitted together with the statement of grounds of appeal (see section V.(a), above) contains data relating to measurement of intrinsic viscosities in two solvents, namely that employed in the measurements reported in the patent in suit and that employed in the examples of F1. These data however played no further role in the appeal proceedings.
- 2.8 In conclusion F14 was admitted to the procedure; F12, F13 and F15 were not admitted.
3. *Art. 123(2) EPC*  
Operative claim 1 differs from claim 1 as granted in that:
- the intrinsic viscosity of the acetone precipitated amorphous rubber fraction of the xylene soluble fraction, IV of AM is restricted to the range 2.5 - 4.5 dl/g. This feature was disclosed in claim 2 of the application as filed and claim 2 of the patent as granted, this has not been challenged by the appellant/opponent;

- The feature "wherein the polypropylene heterophasic copolymer is prepared in a two stage polymerization process by using in the second stage a comonomer ratio (CR) mol/mol of ethylene to propylene in the range of from 0.25 to 0.7."

This latter feature was objected to by the appellant/opponent, arguing that it had only been disclosed in combination with the feature "an appropriate catalyst" (see sections V.(b) and X.(b), above).

3.1 There are two passages in the application as filed (reference being made to the PCT publication pamphlet) disclosing the comonomer ratio.

At page 4 lines 24-29 the comonomer ratio is referred to as being  $>0.25$  mol/mol and  $<0.7$  mol/mol, i.e. the indicated end points being excluded. The indicated comonomer ratio is stated to correspond to an ethylene content in the acetone precipitated xylene soluble phase ( $C_2$  of AM) of  $>20$  wt% and  $<40$  wt%, i.e. again excluding the indicated end points.

At page 7 lines 1-5 it is disclosed that the starting heterophasic copolymer should be produced with a rubbery copolymer fraction where the ethylene copolymer fraction is as small as possible. It is disclosed that this can be done by appropriate choice of catalyst and using preferably comonomer ratios in the range of 0.25 - 0.7 mol/mol, i.e. this disclosure includes the end points.

In the following paragraph the intrinsic viscosity is given as preferably 2.5 - 4.5 dl/g, and the  $C_2$  of AM

specified as "20 wt% - 40 wt%", which is stated to correspond to "a CR of 0.25 - 0.7" i.e. all these disclosures of ranges include the corresponding end points.

- 3.2 The objection of the appellant was directed to the fact that the disclosure of the comonomer ratio as specified in the claim, i.e. in which the end points were included had been disclosed in the application as originally filed, i.e. at page 7 in combination with the feature of "appropriate choice of catalyst". This feature was however absent from the operative claim, which omission was considered to constitute an extension of subject-matter beyond the content of the application as filed contrary to the requirements of Art. 123(2) EPC (see sections V.(b), and X.(b), above).
- 3.3 The question to be answered is thus whether the specification in the claim of the comonomer ratio range as disclosed at page 7, lines 3-4 of the application, i.e. including the end points but without specifying the feature, also disclosed in that passage "appropriate choice of catalyst" constitutes added subject-matter, contrary to the requirements of Art. 123(2) EPC.
- 3.4 In the context of the present case, it is apparent that there are two disclosures of almost identical scope regarding the comonomer ratio. That on page 4 excludes the end points, whilst that on page 7 includes the end points and specifies in addition an "appropriate choice of catalyst". Thus the difference between these two passages in terms of the end points of the comonomer range is an infinitesimal mathematical distinction

between a range which is between the indicated limits values, but is not permitted mathematically precisely to attain either of these limits, i.e. between but (just) excluding 0.25 mol/mol and 0.7 mol/mol respectively and a disclosure of a range between and including these limits.

3.5 For one of these ranges, i.e. the one not including the end points, there is a basis in the original disclosure without any reference to an "appropriate choice of catalyst" (disclosure on page 4). It is only for the other, viz. on page 7, that the range is disclosed - including the end points - in relation to an "appropriate choice of catalyst". It is, however, in the Board's view, technically implausible that this requirement applies to the mathematical end points but not to the remaining entirety of the range. In other words, the original disclosures on pages 4 and 7 when read by the person skilled in the art must be understood to disclose the whole range given at page 7 without any necessary association with the reference to an "appropriate choice of catalyst".

3.6 The conclusion is therefore that the disclosure of a comonomer ratio of from 0.25 to 0.7 mol/mol, i.e. including the end points but not specifying an "appropriate choice of catalyst" does not constitute an extension of the subject-matter beyond that of the application as filed. Consequently claim 1 of the main request meets the requirements of Art. 123(2) EPC.



3.7 No other objections pursuant to Art. 123(2) EPC were raised by the appellant/opponent and the Board has no objections of its own.

3.8 Accordingly it is concluded that the claims of the main request meet the requirements of Art. 123(2) EPC.

4. *Art. 83 EPC*

In the written submissions, the objection pursuant to Art. 83 EPC was directed to the question of the sufficiency of the teaching in respect of the comonomer ratio employed in the second stage of the polymerisation and the ethylene content in the final copolymer (see section V.(c), above). During the oral proceedings a second aspect was introduced, with respect to example 6 of the patent in suit namely that of ascertaining when the requirement of the claim had been fulfilled (see section X.(c), above).

4.1 Regarding the first aspect, the Board notes that the patent defines the content of ethylene in the acetone precipitated amorphous fraction of the xylene soluble phase ("AM") (claim 1, paragraphs [0017]-[0021], [0035]-[0036]), and explains how to determine these values (paragraphs [0044]-[0046]). In paragraphs [0019]-[0021] and [0035]-[0036] the comonomer ratio required in the polymerisation reaction to attain these properties of the AM fraction is disclosed, namely as being from 0.25 to 0.7 mol/mol. The catalyst is discussed both in general, qualitative terms as being "appropriate" (paragraph [0035]), and also in more precise terms with respect to the class of catalyst - Ziegler-Natta, more specifically a propylene stereospecific, high yield Ziegler-Natta catalyst

(paragraph [0025]). There is also a discussion of the type of reactors and the general process steps to be employed in paragraphs [0026]-[0034]. The examples all demonstrate that employing comonomer ratios within the range specified in the claim, i.e. 0.25 to 0.7 mol/mol results in an ethylene content of AM within the range of 20 to 40 wt%.

- 4.2 It is recalled that according to the established case law of the Boards of Appeal, the burden of proof is upon the opponent to establish on the balance of probabilities that a skilled reader of the patent, using his common general knowledge would be unable to carry out the invention (T 182/89, OJ EPO 1991, 391, reasons 2, with reference to T 381/87, OJ EPO 1990, 213).
- 4.3 The appellant/opponent has however failed to advance any evidence that when carrying out the reaction as specified in the patent, in particular employing the class of catalyst indicated and observing the restriction regarding the comonomer ratio in the second stage, the required content of ethylene in AM would not be achieved. Nor has the appellant/opponent identified any deficiency in the written disclosure of the patent in this respect.
- 4.4 Accordingly the appellant/opponent has failed to show that, on the balance of probabilities, the patent in suit fails to disclose sufficiently how to obtain the indicated starting polymer having the specified content of ethylene in AM.  
This objection must therefore fail.

- 4.5 The objections raised at the oral proceedings before the Board with respect to example 6 appear to concern the question of determining whether a given product falls under the claims since, it is argued that in some cases part of the matrix will become dissolved in xylene and precipitated from acetone, meaning that the portion of the polymer which would be measured as the AM fraction is not entirely from the rubber phase.
- 4.5.1 Firstly, this objection appears to be one of clarity, i.e. the question of determining whether a given product falls within the scope of the claim. This is however a matter governed by Art. 84 EPC. Since the feature in question, i.e. C<sub>2</sub> of AM was in the claims as granted, this ground is not available in respect of these features.
- 4.5.2 Secondly, the structure of the product obtained in example 6 and information derivable from the measurements made are explicitly discussed in paragraph [0063] of the patent in suit. In particular it is stated that the copolymer matrix was produced with a specified ethylene content, establishing a distinction over the earlier examples wherein the matrix was propylene homopolymer. The reduction in the IV of AM of the polymer of example 6 was explained to be due to the presence of the amorphous fraction from the matrix, i.e. because that part of the matrix becomes incorporated in the AM fraction.
- 4.5.3 The conclusion is that the reasons for the apparently anomalous result of Example 6 - which has been acknowledged by the patent proprietor to be a comparative example (see section X.(c), above) are

adequately explained in the patent in suit.

In the light of these explanations the mere fact that one of many examples gives an anomalous result - which is explained in the example - does not amount to a demonstration of an undue burden in carrying out the invention.

Consequently these results do not constitute evidence that the disclosure of the patent in suit is in some respect not sufficient.

4.6 It is therefore concluded that the subject-matter of the patent in suit is sufficiently disclosed.

5. *Art. 84 EPC.*

5.1 This objection was directed to the meaning of the comonomer ratio, in particular whether this was at the point of feeding to the reactor or within the reactor itself (see sections V.(d), and X.(d), above).

5.2 As submitted by the respondent/patent proprietor at the oral proceedings (see section X.(d), above) the skilled person would understand this to refer to the monomer that is fed to the reactor, directly and by means of that residual monomer present in the transfer stream from the first stage. In particular it was submitted that this measurement corresponds to what is most technically feasible and realisable.

5.3 The appellant/opponent provided no arguments to dispute this submission.

5.4 In view of these submissions the Board is satisfied that the feature of the comonomer concentration in the

second stage would be understood by the skilled person necessarily and exclusively as relating to that which is fed into the second stage reactor both via the transfer stream from the first stage and by means of introduction of fresh monomer to the 2nd stage reactor. Accordingly this feature is clear.

5.5 The claims of the main request therefore meet the requirements of Art. 84 EPC.

6. *Art. 54 EPC*

Due to the non-admission of F12 and F13 to the procedure (see section 2, above), the only document to be considered with respect to novelty is F1.

6.1 In the statement of grounds of appeal the appellant/opponent relied on examples 19-30 and comparative examples 14-16 in Tables 4 and 5 of F1 (see section V.(e), above).

6.2 These examples relate to the preparation of a propylene heterophasic copolymer in a three stage process. In the first and second stages propylene is employed as the sole monomer. In the third stage a propylene-ethylene mixture is employed. The tables report various properties of the polymers, namely the intrinsic viscosity, (measured in tetralin at 135°C), the polymer content and the ethylene content, both in wt%.

6.3 The Board observes that in all cases the sum of the reported polymer contents for the three stages adds up to 100. Accordingly it appears that the figures given in the columns "Polymer content (wt%)" correspond to the percentage contribution of the indicated "stage" to

the total final product.

According to the text above Table 2 of F1 (page 6, line 10 of F1) the ethylene content is determined by "Infrared Spectrum". However no further details of this determination are given.

6.4 Regarding the amount of ethylene, it is correct, as submitted by the appellant/opponent at the oral proceedings (see section X.(e), above), that the amount of ethylene in the third stage reported in the examples is greater than the proportion of the product of the third stage in the total heterophasic copolymer e.g. in the case of examples 19-22 being 42 wt%, in example 23 being 35 wt%, in example 24 being 65 wt%, in examples 25-27 being 21 wt% and in the case of examples 28-30 being 45%. Although the implication of these reported amounts is that the ethylene contents are reported with respect to that proportion of the total product prepared in the third stage product itself, and not on the totality of the copolymer, in the absence of any detailed explanations in F1 of the determination of this feature it is not possible definitively to derive such a technical teaching from this information.

6.5 In any case, there is no disclosure in F1 of any steps of isolation of a specific fraction of the obtained heterophasic copolymer prior to analysis thereof. Consequently it cannot be concluded that the properties reported for the third stage product of F1 are those of a specific isolated fraction thereof as required by operative claim 1.

Accordingly it has to be concluded that F1 does not disclose the intrinsic viscosity, IV of AM or ethylene

content, C<sub>2</sub> of AM as specified in operative claim 1 of the polymers reported therein.

6.6 The products produced in examples 25-30 and comparative example 16 are subsequently subjected to degradation by treatment with a peroxy compound (F1 page 11, lines 5-10) i.e. visbreaking.

However for the reasons given in the foregoing section 6.5, F1 does not disclose that the products subjected to visbreaking correspond to those specified according to operative claim 1.

6.7 It is therefore concluded that since F1 does not disclose the features, in particular IV of AM and C<sub>2</sub> of AM the subject matter of operative claim 1 is not anticipated by this disclosure.

6.8 The subject matter of claim 1 is therefore novel. Since claims 2-4 are dependent on claim 1 this conclusion applies to these.

No evidence has been advanced that the visbroken polymers derived from the polymers of examples 25-30 and comparative example 16 of F1 would be indistinguishable from those polymers resulting from visbreaking starting materials having the properties specified in operative claim 1.

Accordingly it has to be concluded that the subject matter of claims 5 and 6 is likewise novel.

6.9 It is therefore concluded that the subject matter of the operative claims meets the requirements of Art. 54 EPC.

7. *Art. 56 EPC*

7.1 *The patent in suit, the technical problem*

The patent relates to polypropylene heterophasic copolymers.

It is explained that such polymers, also known as polypropylene block copolymers comprise a polymer matrix with a dispersed rubbery copolymer phase, whereby the matrix is a homopolymer or random copolymer and the rubbery copolymer phase is a reactor blend of an amorphous rubber, a rubber-like copolymer, normally an ethylene-propylene copolymer rubber and a semicrystalline ethylene copolymer (patent in suit paragraphs [0001] and [0002]).

The heterophasic copolymers are produced in two or more reactors, whereby the composition of the rubbery phase is controlled in the second stage by the ethylene/propylene ratio and the amount of hydrogen. The comonomer ratio (CR) ethylene/propylene expressed as mol/mol determines the composition of the rubbery copolymer (paragraphs [0003] and [0004]).

In paragraph [0005] of the patent it is explained that the amorphous rubber content is generally assessed by dissolving the polymer in xylene. The amount of xylene solubles, XS (weight-%) at room temperature corresponds to the amount of rubber. The rubber composition is defined by the ethylene content by weight-% of the xylene solubles, C<sub>2</sub> of AM, where AM is the with acetone precipitated amorphous rubber content in the xylene soluble fraction at room temperature (RT).

It is explained that there is a need for PP heterophasic copolymers with improved properties, in particular materials with good flow and impact characteristics especially for moulding (paragraph [0007]).



It is however difficult to produce PP heterophasic copolymers with a high melt flow rate ("MFR") and with medium or high impact strength directly by polymerisation. The preparation of heterophasic copolymers with very high amounts of rubber - so-called "super high impact copolymers" and high MFR is even more difficult, as explained in paragraphs [0008] and [0009] of the patent.

One route to obtain a high MFR product involves chemical treatment, i.e. visbreaking (peroxide treatment) of a polypropylene heterophasic copolymer. In general such a visbroken polymer however has low impact properties (patent, paragraph [0010]).

Visbreaking of polypropylene results in a narrower molecular weight distribution ("MWD"), since the long molecular chains are more easily broken up. This corresponds to an increase in MFR, resulting in improved flowability. The narrower MWD also affects the physical properties, resulting in lower stiffness and slightly higher impact properties than a standard PP homopolymer or random copolymer with the same MFR (paragraphs [0011] and [0012]).

However ethylene polymers and copolymers undergo crosslinking during visbreaking due to the peroxide. This results in an increase in the molar mass and a great drop in MFR. This manifests itself as gel formation (paragraph [0013]).

The visbreaking of polypropylene heterophasic copolymers is more complicated because of the complex blend composition of homopolymer or random copolymer matrix, amorphous rubber and semicrystalline ethylene copolymer. Both the matrix polymer and the rubber decrease in molar mass, resulting in higher MFR, but the ethylene copolymers are crosslinked, causing

problems in the copolymer with respect to flow and gelling. Mechanical properties - both stiffness and impact strength drop. Further, the consumption of (expensive) peroxide is increased (paragraphs [0014] and [0015]).

Accordingly the patent in suit aims to address the need for polypropylene heterophasic copolymers with good flow and impact characteristics (paragraph [0016]).

7.2 *The solution*

The solution to this problem according to operative claim 1 is a method whereby a polypropylene heterophasic polymer having defined properties, in particular with respect to the AM phase, is subjected to visbreaking.

7.3 *The allegation that the intrinsic viscosity is a bogus feature*

At the oral proceedings before the Board the appellant/opponent argued, for the first time in the entire opposition and opposition/appeal proceedings that the intrinsic viscosity exerted no influence on the outcome of visbreaking (see section X.(f), above). In making this argument the appellant/opponent relied on a comparison between Polymer B2, employed in example 6 (IV of AM 1.7 dl/g, outside the scope of the claims) and Polymer A, employed in examples 1-3, of the patent in suit (IV of AM 3.2 dl/g, within the scope of the claims).

As explained in section 4.5 above, these two polymers differ in the nature of the matrix. In the preparation of Polymer B2 a proportion of 4% of ethylene was employed in the preparation of the matrix, resulting in

a copolymer. In the preparation of Polymer A however solely propylene was employed for forming the matrix, i.e. the matrix was a homopolymer.

The appellant/opponent has provided no arguments or evidence that effects arising from differences between the AM phase of the two polymers, specifically the intrinsic viscosity thereof, could be isolated from effects arising from the difference between the matrices of the two polymers under consideration. Consequently, it has not been shown that comparison of the properties of the heterophasic copolymers of examples A and B2 before/after visbreaking would render it possible to draw any conclusions regarding the influence specifically of the properties of the AM phase.

Accordingly it has not been shown that a comparison of the results reported for the two polymers A and B2 in the patent in suit would be suitable to provide evidence that the intrinsic viscosity of the AM phase exerted no influence.

Even if, nevertheless such a comparison were to be carried out, i.e. that, for the sake of argument the differences in the matrix polymers were to be disregarded, closer examination of the evidence provided by these examples would not lead to the conclusion that the IV of the AM phase was devoid of any effect on the properties of the heterophasic polymers and their behaviour on visbreaking.

It is correct, as submitted by the appellant/opponent - that after visbreaking, the resulting polymers - example 1 derived from Polymer A and example 6 derived from Polymer B2 have approximately equal performance in the Instron falling weight test at 0°C and -20°C of, respectively 40 and 41 J for example 1 and 38 and 41 J

for example 6.

However other properties, in particular the Izod impact strengths are significantly different. In the case of Example 1 values of 13.9, 10.6 and 7.8 kJ/m<sup>2</sup> are reported at temperatures of room temperature, 0°C and -30°C respectively. In contrast thereto for example 6 the corresponding values are 9, 7 and 3.8 kJ/m<sup>2</sup>, i.e. significantly lower. Similarly the tensile and flexural moduli of Example 1 are 1120 and 1080 MPa respectively, whilst the corresponding values for example 6 are 460 and 430 MPa. The pre-visbreaking values of Izod impact strength and tensile and flexural moduli are also significantly higher in the case of starting Polymer A than in the case of starting Polymer B2.

Based on this analysis, it must be concluded that the IV of the AM phase results in improvements to the Izod impact properties and to the tensile and flexural moduli both before and after visbreaking.

Consequently the available evidence does not support the contention of the appellant/opponent that the feature IV of the AM phase is of no significance. Consequently this feature will be taken into account in the further consideration of inventive step.

7.4 *The evidence provided by the examples of the patent in suit*

Polymer A (according to the invention) and Polymer A1 (comparison) both have contents of ethylene (C<sub>2</sub> of AM) within the claimed range, namely 28 wt% and 27 wt% respectively. However the IV of AM in the case of polymer A (3.2 dl/g) is within the scope of claim 1 whereas that of polymer A1 (1.9 dl/g) is outside the scope of claim 1.

Polymer A is subjected to three levels of visbreaking,

denoted examples 1, 2 and 3. The melt flow rate (MFR) of the initial copolymer is 12.1 g/10 minutes. The visbroken polymers according to examples 1-3 have rates of 37, 45.4 and 66 g/10 minutes, corresponding to a relative increase in melt flow rate (i.e. visbreaking ratio) of 3.1, 3.7 and 5.5 respectively.

Comparison Polymer A1 has an initial MFR of 22.9 g/10 minutes, which on visbreaking is increased to 52 g/10 minutes, a ratio of 2.3.

Examination of the physical properties of the polymers reveals the following:

- The tensile modulus of Polymer A (1180 MPa), is reduced, at the lowest level of visbreaking (ratio 3.1, example 1) to 1120, i.e. to 95% of the original value and at the highest level of visbreaking (5.5, example 3) to 1060, i.e. 89% of the original value.
- The tensile modulus of comparison Polymer A1 is reduced - at a degree of visbreaking of 2.27 (comparison example 1), i.e. lower than any of those applied to Polymer A to 92% of the original.
- The Instron falling weight impact strength is reduced, in the case of Polymer A at 0° to between 98% and 71% of the original at the lowest and highest visbreaking ratios respectively. At -20°C the reduction is to between 100% and 63% of the original value.
- Comparison Polymer A1 undergoes a reduction to 76% of the original value in the Instron falling weight test, it being recalled that this is at a degree of visbreaking lower than any of those employed for examples 1-3.

- The values for the Izod notched test at room temperature show for Polymer A (examples 1-3) a greater proportional reduction on visbreaking (to between 75-58% of the original value at RT or to 81-64% of the original value at -30°C) than those of the comparison example (88% of the original value at RT or to 98% of the original value at -30°C). However the absolute values reported for the examples 1-3 based on Polymer A are in all cases higher by a factor of ca. 2 than those values reported for the comparison example Polymer A1.

Comparison examples 4 and 5, also based on a variation of example 1, relate to a starting heterophasic copolymer wherein the content C<sub>2</sub> of AM is 45wt%, i.e. above the maximum specified in operative claim 1. The evidence of comparison example 4, employing a visbreaking ratio of 4.7, i.e. between those of (inventive) examples 2 and 3 is that:

- compared to the starting copolymer the stiffness (tensile, flexural moduli) is virtually unchanged;
- the impact results, both Izod and falling weight show reductions to ca 20% (Izod, room temperature), 47% (falling weight, room temperature) or 40% (falling weight, -20°C) of the original values. This is contrasted with a maximum reduction to 71% or 63% of the original value in the case of examples 1-3. Further the absolute values after visbreaking in the case of comparison example 4 were lower than in the case of examples 1-3.

- Similar tendencies are exhibited by the other examples and comparative examples of the patent in suit.

7.5 The conclusion that can be drawn from the evidence provided by the examples of the patent in suit is that when the starting polymer has the properties of IV of AM and C<sub>2</sub> of AM as specified in the claim, for a given increase in melt flow rate, the resulting (relative) reduction in mechanical properties, specifically impact strength and stiffness (i.e. compared to the non-visbroken polymer) is lower than in the case of compositions wherein these are not met.

This evidence thus shows that the problem as set out in the patent in suit is solved by the features specified in the independent claims.

7.6 *F14 as closest prior art*

The appellant/opponent proposed F14 as the closest prior art.

This document relates according to its title to polypropylene compositions having improved impact strength properties at low temperatures and a process for preparing these. Specifically, F14 relates to polypropylene compositions consisting of polypropylene modified with an amorphous ethylene/propylene copolymer (col. 2, lines 4-8), i.e. heterophasic copolymers. In particular F14 relates to the preparation of a polymer by a stereoregular homopolymerisation step and successively a copolymerisation step of ethylene-propylene mixture, in which the resulting polymer has relatively low values of the ratio between total polymerised ethylene and the amorphous fraction. It is

taught that due to the relatively low content of total polymerised ethylene necessary to attain improvements to the impact strength of the polypropylene, the mechanical properties do not suffer worsening (col. 2, lines 35-38).

Although the examples of F14 do report the ethylene content of the copolymers, the fraction as specified in the operative claims of the patent in suit, i.e. "C<sub>2</sub> of AM", derived from the xylene soluble fraction, is not reported in F14. Accordingly F14 does not disclose the parameters of the polymers specified in the operative claims.

F14 teaches that the impact strength is superior to that of prior art polymers (col. 2, lines 28-34).

F14 does not contain any reference to visbreaking of the polymers.

#### 7.7 *Obviousness*

As explained above, F14 does not disclose the polypropylene heterophasic copolymers employed in the method according to operative claim 1, since neither ethylene content nor the intrinsic viscosity of the AM fraction, as specified in operative claim 1 are discussed in F14.

Further there is no reference in F14 to the problem underlying the patent in suit, namely that of providing polypropylene heterophasic copolymer with good flow and impact properties (cf paragraph [0016] of the patent in suit).

Consequently this document, chosen by the appellant/opponent as the closest prior art, to the extent that it does not concern one essential aspect of the relevant technical problem, can hardly be said to



give a hint to the solution of such a problem. Furthermore, as indicated above, there is no reference whatsoever to a step of visbreaking. In other words, both an essential aspect of the problem and an essential element of its solution are missing from this document. Consequently there is a *fortiori* no incentive for the skilled person to combine this disclosure with that of a further document such as F5 which would describe visbreaking since such an approach would be *ex post facto*.

7.8 The subject matter claimed therefore does not arise in an obvious way from the state of the art and consequently meets the requirements of Art. 56 EPC.

8. *Request to consider F1 as the closest prior art.*

8.1 In the statement of grounds of appeal, the appellant/opponent indicated that in the case that F1 would be found not to anticipate the subject-matter of the operative claims that it would be "used for the assessment of inventive step" (see section V.(g), above).

No corresponding arguments were however presented.

8.2 Such an approach is however not in accordance with the Rules of Procedure of the Boards of Appeal, Art. 12(2) of which stipulates that the statement of grounds of appeal, and the reply shall contain a party's complete case. Further this Article requires that the parties set out expressly all the facts, arguments and evidence relied on.

This requirement is not satisfied merely by indicating in the Statement of Grounds of Appeal that arguments in

respect of one requirement of the EPC might, under certain conditions, be presented in the light of a certain piece of evidence, with no indication of the details of such arguments.

Accordingly pursuant to Art. 12(2) RPBA an argument of lack of inventive step based on F1 as the closest prior art does not form part of the appeal procedure.

8.3 At the oral proceedings before the Board the appellant justified this request by reference to non-identified case law according to which, it was submitted, it was not possible, in opposition proceedings, simultaneously to rely on the same document for submissions with respect to novelty and inventive step.

8.4 This argument is rendered less convincing by the actions of the opponent itself during the first instance proceedings since such a strategy was in fact adopted. In the notice of opposition, F1 was cited initially against novelty. Then, under the heading "Lack of inventive step (Art. 56)" the opponent also presented arguments based on F1, expressly for the case that the disclosure thereof was not considered to be novelty destroying. The patent proprietor followed this structure and sequence in its rejoinder to the notice of opposition.

At no point in the opposition procedure was any objection raised either by the patent proprietor or by the opposition division to this strategy.

8.5 Further it must be considered that under the circumstances of opposition appeal proceedings where the first instance has already issued a finding on novelty, i.e. that the subject-matter of the claims was

novel, it is to be expected that the opponent would attempt in a first step to have that finding overturned. It would equally be expected that, as a contingency for the case that the Board were to follow the reasoning of the first instance and conclude that the subject-matter claimed was novel, then the opponent would be in a position (a) to predict which feature(s) would be considered not to be anticipated by the prior art and (b) to formulate arguments with respect to inventive step taking account of such distinguishing features. To do so would not be contradictory or inconsistent, but would simply represent a cogent, structured strategy for constructing the case on appeal.

The objection of lack of inventive step based on F1, which constituted a change of case compared to that set out in the Statement of Grounds of Appeal was consequently not admitted to the procedure.

## **Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

E. Goergmaier

R. Young