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**Datasheet for the decision
of 2 February 2016**

Case Number: T 1712/10 - 3.2.05

Application Number: 95305665.2

Publication Number: 0700769

IPC: B29C47/00

Language of the proceedings: EN

Title of invention:

Process for modifying a polyethylene in an extruder

Patent Proprietors:

Ineos Sales (UK) Limited
BP Chemicals S.N.C.

Opponents:

Basell Polyolefine GmbH
Union Carbide Corporation
Exxon Chemical Patents, Inc.

Relevant legal provisions:

EPC R. 99(1) (a), 99(1) (c)
EPC 1973 Art. 56

Keyword:

Admissibility of appeal - notice of appeal (name of appellant,
request defining subject of appeal)
Inventive step - no

Decisions cited:

G 0007/93, T 0208/03, T 0347/07



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Case Number: T 1712/10 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 2 February 2016

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Decision under appeal:

**Decision of the opposition division of the
European Patent Office posted on 4 June 2010
revoking European patent No. 0700769 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman M. Poock
Members: H. Schram
D. Rogers

Summary of Facts and Submissions

- I. On 2 August 2010 the appellants (patent proprietors) lodged an appeal (third appeal) against the decision of the opposition division, posted on 4 June 2010, by which European patent No. 0 700 769 was revoked for the third time, this time on the grounds that the subject-matter of claim 1 of the main request and of the auxiliary request did not involve an inventive step, Article 56 EPC 1973. The statement setting out the grounds of appeal was filed on 4 October 2010.

The opposition division did not admit the amended second auxiliary request presented by the appellants at the end of the oral proceedings held on 24 March 2010 (the former second auxiliary request had been filed on 24 February 2010), see point 7 of the Reasons.

The European patent was revoked a first time by the opposition division on the grounds that the invention was not disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The opposition division's decision was set aside by the board of appeal 3.2.05 in its decision T 208/03 of 20 April 2005 and the case remitted to the opposition division for further prosecution.

The patent was revoked a second time by the opposition division on the grounds that the invention was not new. In decision T 347/07 of 29 January 2009 that decision was set aside by the board of appeal 3.2.05 and the case was again remitted to the opposition division.

- II. In a detailed communication dated 12 February 2015 annexed to the summons to attend oral proceedings the board expressed *inter alia* its provisional opinion that

the appeal seemed to be admissible (see point 5.3 of said communication), that the board was at that time not inclined to admit the second auxiliary request into the opposition appeal proceedings (see point 6.3), that the values of tests No. 1 to 7 for the loss tangent reduction (listed in Tables 2 and 3 of the patent under the heading "Treatment conditions") seemed to be *calculated* from comparing the initial value before treatment and the final value after treatment (ie not a "treatment condition" that can be chosen and varied independently, see point 8.5), that document E1 appeared to represent the closest state of the art (see point 13, second paragraph), that the subject-matter of claim 1 of the main request did not seem to involve an inventive step with respect to document E1 (point 17), that the amendments to claim 1 of the first auxiliary request appeared to meet the requirements of Article 123(2) EPC (point 18.3), that the subject-matter of claim 1 of auxiliary request 1 did not seem to involve an inventive step (point 19), and that in view of the above, it would appear that the appeal was likely to be dismissed (point 20).

- III. No substantive replies to the above communication of the board were received by the parties to the appeal proceedings.
- IV. Oral proceedings were held before the board of appeal on 2 February 2016.

Respondents I and III (opponents 01 and 03) informed the board on 21 and 24 April 2015, respectively, that they would not attend the oral proceedings. On 28 September 2015 the appellants informed the board, that it would also not attend the oral proceedings. Respondent II (opponent 02) informed the board on 4 January 2016 that

it currently did not intend to attend the oral proceedings. On behalf of the parties no one was present at the oral proceedings.

- V. The appellants requested in writing that the decision under appeal be set aside and, that as a main request, the patent be maintained as granted, or alternatively that the patent be maintained upon the basis of either the first or second auxiliary request, both filed under cover of a letter dated 4 October 2010.

Respondents I and III requested in writing that the appeal be dismissed.

Respondent II requested in writing that the appeal be declared inadmissible, or alternatively that the appeal be dismissed, and further that the second auxiliary request not be admitted into the proceedings.

- VI. Claim 1 of the main request (claims as granted) reads as follows:

"Process for improving the bubble stability of a linear polyethylene converted into film by blown extrusion, the polyethylene having a density of 0.900 to 0.970, preferably from 0.932 to 0.965 g/cm³, a molecular mass distribution such that the ratio of the weight-average molecular mass, M_w , to that based on the number-average, M_n , is from 8 to 40, preferably from 9 to 30, and a value of the loss tangent measured by dynamic rheometry at 190 °C at a frequency of $1.5 \cdot 10^{-2}$ radians per second, ranging from 1.5 to 3, preferably from 1.6 to 2.5, the process being characterized in that, before its complete melting in an extruder, the polyethylene is brought into contact with oxygen or a gas mixture containing oxygen, and the polyethylene thus brought into contact is

treated thermomechanically in the molten state in the extruder supplying a specific mechanical energy of 0.15 to 0.5, preferably from 0.17 to 0.35 kWh per kilogram of polyethylene, the preliminary bringing into contact and the thermomechanical treatment being combined so that the treatment is conducted to its completion when the value of the loss tangent of the polyethylene has lost from 15 to 70 %, preferably from 20 to 65 % of its initial value before treatment and bringing into contact."

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the expression "0.15 to 0.5, preferably from 0.17" has been replaced by the expression "0.20" and in that the expression "15 to 70 %, preferably from 20 to 65 %" has been replaced by the expression "25 to 60 %".

VII. The following documents were inter alia referred to in the appeal proceedings:

E1 EP-A 0 121 740;

E4 *Elongational flow of HDPE Samples and Bubble Instability in film blowing*, Fleissner M, International Polymer Processing II (1988) 3/4, 229-234;

E9 *Comparison of rheological properties of cross-linked and thermal-mechanically degraded HDPE*, Harlin A and Heino E, Journal of Polymer Science: Part B: Polymer Physics, Vol. 33 (1995), 479-486;

E11 *Analysis of long chain branching in high density polyethylene*, Hughes JK, ANTEC 1983, 306-309;

- E16 *Effect of polydispersity on the thermo-mechanical degradation of HDPE polymerized using a chromium catalyst*, Harlin A and Vainio E, *Polymer Degradation and Stability* 39 (1993), 29-34;
- E18 *Chemical modification of polyolefins in extruders - chain scission, long chain branching, crosslinking and grafting*, Hamlelec et al., *Compalloy '90*, pp. 83, 85-145;
- E24 *The effect of stabilizers on the crosslinking vs. scission balance during melt processing of LLDPE*, Johnston RT and Slone EJ, *Polyolefins VII International Conference*, February 24-27 1991, Houston, TX;
- E38 *First Experimental Report - Oxygen tailoring study*, of Mr Neubauer, dated 17 December 2008.
- E42 *Second Experimental Report - Oxygen tailoring study*, of Mr Neubauer, dated 26 February 2010.

VIII. The arguments of the appellants, in writing, can be summarized as follows:

Inventive step of the main request

In the decision under appeal the opposition division held that document E16 was the closest prior art. This document did not provide any specific teaching directed towards film blowing or bubble stability, apart from the opening sentence in the introduction: "*High-density polyethylene holds an important position in the packaging industry, for example in blow molded bottles and blown films, and also in technical applications, such as pipes and cables*". Whilst some extrusion experiments in this document were performed under

oxygen, the majority were performed under nitrogen, see page 30, right column ("*Some extrusions were carried out with air in the feed hopper, but most of them were done under a nitrogen blanket.*"), page 31, left column ("Unless otherwise mentioned, all materials were stabilized and compounded under nitrogen.") and page 33, left column, Table 3). It was thus only with hindsight that the opposition division took as closest prior art the extrusions carried out with air in document E16. According to the opposition division, the objective problem to be solved with respect to said document was to improve bubble stability (point 5.4 of the Reasons), and that this was achieved by increasing long chain branching (LCB), cf documents E4, E11, E18 and E1. However, none of the documents E4, E11 and E18 directed the person skilled in the art to the use of oxygen. Whilst document E4 was silent on use of oxygen, document E11 and E18 taught to use peroxide for cross-linking. This argument had been raised during the oral proceedings, but was rejected by the opposition division, which held that the insertion of peroxide and oxygen into the treated material were "similar" due to the separation of the oxygen from the peroxide.

This opinion of the opposition division was contradicted by the post-published document E9. This document stated "*Branching through cross-linking must be regarded as completely different from LCB caused by thermal-mechanical degradation and thermal degradation, because of a totally different chemical structure (Fig. 1)*", see sentence on page 480 bridging the two columns. That cross-linking with peroxide and thermal-mechanical degradation with oxygen operated by different mechanisms was also clear from document E8, where a cross-linking agent was added to the polymer and the pelletizing was conducted with oxygen (column 5, Table and claim 1).

Document E9 also taught (passage bridging pages 483 and 484, and Figure 7) that the molecular weight, especially the high molecular weight tail of the molecular weight distribution (MWD), influenced the G'/G'' upturn much more than the LCB. Reference was further made to page 483, right column, first paragraph (*"Peroxide cross-linked materials ... behaved totally differently from the thermal-mechanically degraded materials"*) and second paragraph (*"Although the G'/G'' values of the cross-linked materials ... clearly increased, those of the thermal-mechanically degraded material containing LCB did not exhibit even slightly increased values (see A21 and A23 in Fig. 6), evidently because of the simultaneous degradation of high molecular weight material"*), showing that an increase in LCB of the materials A21 and A23 thermally treated under nitrogen did not lead to an upturn in loss tangent. Document E9 taught that changes in loss tangent were more complicated than simply an increase in LCB or cross-linking (see in particular the results presented under nitrogen which showed long chain branches but no change in loss tangent).

The opposition division was therefore wrong to conclude that any of documents E4, E11 or E18 could teach the person skilled in the art anything regarding the use of oxygen according to the process of the present invention. Document E1, which teaches the use of oxygen to improve the properties of products for blow-moulding, was silent on the relevance of this to film blowing. Starting from document E16, the person skilled in the art would not arrive at the subject-matter of claim 1 as granted taking into account documents E1, E4, E11 or E18.

In points 5.8 to 5.11 of the decision, the opposition division investigated whether the claimed initial loss tangent and the change in loss tangent had any specific effect, and concluded on the basis of the second experimental report of respondent II, document E42, that there were no technical effects associated with the claimed ranges because good bubble stability could be obtained inside and outside of the claimed ranges. Firstly, it was noted that in the first experimental report of respondent II, document E38, completely different results were obtained. Secondly, in document E42 relatively low temperatures and low SME's were selected, which led to low changes in the loss tangent close to the lower limit of 15 % of claim 1 as granted. This highlighted the "selective" nature of the results presented in document E42. Since there was no value of bubble stability for the material prior to treatment, it was not possible to determine from the Sample 1 to 3 results whether the treatment provided an improvement compared to the initial material. The Sample 4 results had no relevance to the present invention since the loss tangent of the tested material was 30, ie well above the range claimed in claim 1 as granted. The opposition division reasoning, that if there was a technical effect there would not be results of good bubble stability outside the claimed ranges or poor bubble stability inside the claimed ranges, and that therefore, since there were such results, there was no technical effect, was flawed. The selection of a range of loss tangent for materials which have poor initial bubble stability which can be improved by treatment with oxygen did not preclude that there were materials with good bubble stability outside the claimed range at all. In fact, by definition, selecting materials within a range which has poor initial bubble stability should exclude materials which have a better initial bubble stability and which

therefore would be outside the claimed range. The fact that materials can have relatively poor bubble stability even after treatment did not mean that the bubble stability had not been improved compared to the initial materials.

For the above reasons, the subject-matter of claim 1 as granted involved an inventive step.

Inventive step of the first auxiliary request

The reduced ranges of SME and the change in loss tangent as claimed in claim 1 of the first auxiliary request resulted in a further optimisation of the treatment. The subject-matter of said claim therefore involved an inventive step as well.

- IX. The arguments of respondent II, in writing, can be summarized as follows:

Inadmissibility of the appeal

The notice of appeal filed by the appellants neither contained the address of the appellants nor a request defining the subject of the appeal as stipulated in Rule 99(1)(a) and 99(1)(c) EPC, respectively. The appeal was therefore to be declared inadmissible.

Non-admittance of the second auxiliary request

The second auxiliary request of the appellants, which was originally presented during the oral proceedings before the opposition division, had not been admitted into the proceedings by the opposition division and should not be admitted into the appeal proceedings by the board.

Inventive step of the main request

Document E16 was a good starting point for assessing inventive step. Under the problem-and-solution approach, one should of course start from that part of the disclosure in said document which utilised oxygen rather than nitrogen. Appellants' submissions regarding the additional teachings of documents E4, E9, E11 and E18 were not relevant, since no additional teaching was required with respect to E16 insofar as it related to the use of oxygen. The person skilled in the art was well aware that increasing long-chain branching improved bubble stability, see eg Reasons 5.5 of the decision under appeal, wherein it was stated that the influence of LCB of the bubble stability was generally known in the art inter alia from documents E4, E11, E18 or E1. Indeed document E18 was explicit about this (cf passage bridging pages 87 and 88): "*Controlled long chain branching with low levels of crosslinking during the LLDPE and HDPE melt processing is of interest in blown film applications to permit down gauging without adding LDPE. High melt strength and improved bubble stability are observed*". Document E24, in the third paragraph on page 208, states that "light crosslinking increases melt strength and bubble stability in film processes".

The opposition division followed the problem-and-solution approach and considered what effect the initial loss tangent and reduction in loss tangent had on the properties of the final polyethylene produced. It concluded in Reasons 5.11 of its decision that these were merely arbitrary selections and consequently found that claim 1 of the main request lacked an inventive step. Furthermore, it should be pointed out that the claimed process simply prepared a composition which may subsequently be blown into a film. This necessarily involved a further extrusion step, which itself changed the loss tangent further. Therefore any particular loss

tangent reduction achieved in the claimed process was again entirely arbitrary since it was changed further in the subsequent extrusion.

The appellants had argued that in document E42 completely different results were obtained than in document E38. This was incorrect. The experiments in document E42 were intended to show the effect of oxygen concentration, initial loss tangent and reduction in loss tangent on bubble stability. On the other hand, document E38 was filed to support the lack of novelty objections by replicating what was disclosed in the prior art in terms of process conditions.

Allowability of the amendments to claim 1 of the first auxiliary request

While the new range for the specific mechanical energy of 0.20 to 0.35 kWh per kilogram of polyethylene and the new range for the reduction of the loss tangent of the polyethylene, namely 25 to 60 %, were individually disclosed in the application as filed, the precise combination was not. Claim 1 of the first auxiliary request did therefore not meet the requirements of Article 123(2) EPC.

Inventive step of the first auxiliary request

The opposition division correctly concluded that claim 1 of the first auxiliary request also lacked an inventive step. The narrower range of specific mechanical energy was known from document E16, and for the same reasons as given above with respect to the reduction in loss tangent, the reduction by 25 to 60% was again arbitrary. Consequently, for the same reasons as given for the main request, the first auxiliary request also lacked inventive step.

- X. The arguments of respondent III, in writing, can be summarized as follows:

Inventive step of the main request

Document E16 was a relevant document, since it pertained to high-density polyethylenes in general, which hold "an important position in the packaging industry, for example in blow molded bottles and blown films" (page 29, left column) and since it was concerned with long-chain branching, a characteristic particularly relevant for bubble stability. This document disclosed extrusion experiments under two different ambient conditions, namely under oxygen (air) and under nitrogen (page 30, right column). This document taught that the use of oxygen increased "irregularities in the linear molecular structure" (page 32, right column). From the same paragraph it was clear that irregularities were understood as evidence of branching (see also page 29, right column, stating that long-chain branching increased with oxygen content).

The appellants had stated in its statement setting out the grounds of appeal (page 3, seventh paragraph) that document E9 clearly taught that oxygen, LCB's and crosslinking agents were not "equivalent", and referred inter alia to the passage at page 483, right column, third paragraph, and Figure 6. However, said passage referred to materials A21 and A23 which were thermally treated under nitrogen. A distinction between peroxide and oxygen was also not derivable from document E8. On the contrary, this document taught that oxygen and peroxide acted similarly, with the additional conclusion that a combination of molecular oxygen (O₂) and radical oxygen (peroxide) led to improved results compared to molecular oxygen alone. Documents E1 and E11 taught

therefore the influence of oxygen on the production of LCB.

The selection of the specific range of values of the loss tangent of the polyethylene from 1.5 to 3, and the loss after the thermo-mechanical treatment of 15 to 70% of its initial value according to claim 1 were obvious for the skilled person in light of his common general knowledge. The change in loss tangent as claimed was not a specific measure that someone would not take, but rather an inevitable consequence of the extrusion. Moreover, within the claimed change there was no correlation with any specific effect (see document E42).

The appellants had argued that the data presented in document E42 were not significant as they did not allow a comparison of the tested (extruded) material with the initial material. However, it was the prior art processes vis-à-vis which the claimed process must be distinguished, and the claimed invention had to produce an unexpected effect vis-à-vis these processes (cf Guidelines CIV 3.1). The analysis of the opposition division of the data presented in document E42 in Reasons 5.9, last paragraph, was correct.

Allowability of the amendments to claim 1 of the first auxiliary request

The amended ranges for the specific mechanical energy and for the reduction of the loss tangent were mentioned independently from each other in the application as filed, whereas in claim 1 of the first auxiliary request the ranges were claimed in combination. According to said claim the specific mechanical energy was chosen to be in the range from 0.20 to 0.35 kWh, "so that" the treatment was completed when the loss tangent had lost

from 25 to 60% of its initial value. Such a correlation was not disclosed in the application as filed.

Inventive step of the first auxiliary request

The narrower ranges do not alter the above conclusions regarding inventive step. Claim 1 of the first auxiliary request was therefore not based on an inventive step.

XI. The arguments of respondent I, in writing, can be summarized as follows:

In the meantime both respondent II and respondent III had explained in detail why the appeal of the appellants should be dismissed. Since the main request and the first and second auxiliary requests of the appellants were identical to the requests defended before the opposition division, reference was made to the submissions concerning their patentability filed by respondent I during the opposition proceedings. In the light of this, a comprehensive reply to the statement of grounds of the appellants was dispensed with, also with a view to avoid unnecessary repetitions.

Reasons for the Decision

1. *Admissibility of the appeal*

1.1 The notice of appeal contains the name of the proprietor and appellant, the indication "Opposition to European Patent EP 0 700 769 B1" and the statement: "Further to the Opposition Division's letter of 4th June, 2010 reporting the decision revoking the above mentioned European Patent, the Proprietor hereby files a Notice of Appeal in accordance with Articles 106-108 EPC".

The notice of appeal does not contain an explicit address of the appellant, Rule 99(1)(a) EPC.

However, it is established case law that the provisions of Rule 99(1)(a) EPC are deemed to be satisfied if the notice of appeal contains sufficient information for identification of a party, see Case law of the Boards of Appeal (CLBA), 7th Edition, IV.E.2.5.2, in particular page 953, line 8, to page 955, last line.

In the present case the board is of the opinion that the notice of appeal contains sufficient information for identifying the appellant(s), namely appellant/ proprietor 1, BP Chemicals Limited, and appellant/ proprietor 2, BP Chemicals S.N.C. It may be noticed that current name of appellant 1 is Ineos Sales (UK) Limited.

- 1.2 The notice of appeal does not contain an explicit request defining the subject of the appeal, cf Rule 99(1)(c) EPC.

It is also established case law that the provisions of Rule 99(1)(c) EPC are deemed to be satisfied if the statement setting out the grounds of appeal indicates the extent to which the decision impugned is to be amended (cf Rule 99(2) EPC). Moreover, when the notice of appeal filed by a patent proprietor is directed against a decision of an opposition division, in which the only ruling is that the patent is revoked (which is the case here), and if said notice contains the wording "(we) hereby file a notice of appeal" or similar, the provisions of Rule 99(1)(c) EPC are also deemed to be satisfied, see CLBA (loc. cit.), in particular page 956, line 13, to page 956, line 30.

- 1.3 For the above reasons, the appeal is admissible.

2. *Admittance of the second auxiliary request into the opposition appeal proceedings*

2.1 In exercising its discretion under Article 114(2) EPC 1973, the opposition division did not admit the second auxiliary request, which was filed during the third oral proceedings before the opposition division, into the opposition proceedings, on the grounds that it was late-filed.

The second auxiliary request of the appellant is identical to the second auxiliary request that was not admitted by the opposition division.

2.2 It is established case law that in general "..., it is not the function of a Board of Appeal to review all the facts and circumstances of the case as if it were in the place of the first instance department, in order to decide whether or not it would have exercised such discretion in the same way as the first instance department", see G 7/93, OJ EPO 1994, 775, point 2.6 of the Reasons.

A board of appeal should only overrule the way in which a department of first instance has exercised its discretion if it has applied the wrong principles, or not taken account of the right principles, or has acted in an unreasonable way and has thus exceeded the proper limits of its discretion, see G 7/93 (loc. cit.).

2.3 The board expressed in its communication (see point II above) that the opposition division did not act in an unreasonable way by not admitting the second auxiliary request into the proceedings, and that therefore it was

currently not inclined to admit the second auxiliary request into the opposition appeal proceedings.

Since these findings were not contested, the board has no reason to deviate from them. Consequently, the second auxiliary request of the appellants is not admitted into the opposition appeal proceedings.

MAIN REQUEST

3. *Ground for opposition under Article 100(a) EPC 1973 in combination with Article 56 EPC 1973*

3.1 The patent in suit

- 3.1.1 In the earlier decision T 347/07 (see Reasons 1.1.4) it was held that document E1 does not disclose a process in which (i) the polyethylene has an initial loss tangent measured by dynamic rheometry at 190°C at a frequency of 1.5×10^{-2} radians per second, ranging from 1.5 to 3 and in which (ii) the reduction in loss tangent during treatment is from 15 to 70 %.

The distinguishing features are henceforth referred to as features (i) and (ii).

The feature "for improving the bubble stability of a linear polyethylene converted into film by blown extrusion ..." of claim 1 of the main request is hence no distinguishing feature with respect to documents E1. It is thus not relevant that document E1 relates (page 1, lines 2 to 6) to a process for treatment of a high density polyethylene "so as to produce a resin suitable for blow moulding" rather than to a polyethylene intended for producing a film.

3.1.2 The process of the invention is referred to as a thermo-mechanical treatment and aims at adjusting "certain viscoelastic properties of the polymer, especially by a partial and specific crosslinking by virtue of oxygen or air under particular mechanical stress conditions, by creating some long branching and/or some transverse bonds between macromolecular chains in the macromolecular network", see paragraph [0006] of the patent.

3.1.3 The relevant viscoelastic property of the polymer polyethylene is defined by the loss tangent, see paragraph [0012] of the patent. According to claim 1 as granted, the polyethylene to be processed must have a density of 0.900 to 0.970 g/cm³, a loss tangent of 1.5 to 3, and a Mw/Mn-ratio from 8 to 40. After the thermo-mechanical treatment, which involves bringing the polyethylene before its complete melting into contact with oxygen or a gas mixture containing oxygen in an extruder and supplying a specific mechanical energy (SME) of 0.15 to 0.5 kWh/kg, the initial value of the loss tangent is reduced by 15 to 70 %.

The claimed process is defined by selecting a particular polyethylene (density, loss tangent, Mw/Mn-ratio) and a particular thermo-mechanical treatment which involves using oxygen, a particular specific mechanical energy and a particular reduction of the loss tangent. If the invention is carried out by a person skilled in the art within the parameter ranges specified in the claim, said person may expect that the polyethylene thus modified is suitable to be converted into film with satisfactory or sufficient bubble stability, ie apart from isolated failure. Bubble stability is a parameter of a descriptive nature, ie in this sense it is not well-defined in the art. Its "values" form a continuous

spectrum from eg "very bad" to "very good". The parameter ranges for the loss tangent and the reduction of the loss tangent specified in claim 1 as granted should therefore not be construed to mean that inside the claimed parameter ranges the bubble stability is excellent, and outside said ranges unacceptable. The conditions of the thermo-mechanical treatment of the claimed process are not exhaustively defined by the claimed ranges for initial loss tangent and SME. For example, the mixture of additives, quantity of oxygen and die temperature may influence the bubble stability, and these parameters are not explicitly specified in claim 1 as granted.

3.1.4 About the choice of the initial loss tangent the patent in suit states the following (see paragraph [0013]): It has been found, in fact, that linear polyethylenes which exhibit the bubble instability defect during conversion by blown extrusion and which are capable of having their defect corrected by the process of the invention, have an initial value, before treatment, of the loss tangent ($\text{tg } \delta$) which lies in the range described above [ie from 1.5 to 3]. This appears to be the only statement in the patent about the initial loss tangent range. The patent is silent about the reason why polyethylenes having inter alia an initial loss tangent from 1.5 to 3 are suitable candidates to be modified for improving the bubble stability when converted into film by blown extrusion.

3.1.5 The findings in the above points 3.1.1 to 3.1.4 were expressed in points 8.2 to 8.4, respectively, of the communication of the board (cf point II above). Since these findings were not contested, the board has no reason to deviate from them.

3.2 The closest prior art

Document E1, which is cited in paragraph [0005] of the patent, represents the closest state of the art, since it unambiguously teaches a process that comprises pelletizing polyethylene in the presence of air or oxygen in an extruder, and the advantages with respect to the surface appearance if the modified polyethylene is converted into a blow molded product.

This document discloses a process for improving the surface appearance of a polyethylene resin converted into a blow molded product. It was extensively discussed in point 13 of the communication of the board (cf point II above). In the last paragraph thereof the board stated that it appeared that the effect of the oxygen concentration on the viscoelastic properties of the polyethylene reported in the patent in suit was to a large extent already known from document E1.

3.3 Point 17 of said communication of the board, wherein the board expressed its provisional opinion on inventive step of claim 1 of the main request reads as follows:

"During the oral proceedings it must in particular be discussed, whether it was obvious to the person skilled in the art, starting from document E1, and seeking to improve the properties of the polyethylene if it is converted into a blow molded product or into film, with respect to the surface appearance or bubble stability, respectively, to select (i) an initial loss tangent from 1.5 to 3 and (ii) a loss tangent reduction of 15 to 70 %.

With respect to distinguishing feature (ii), it seems that the person skilled in the art already knows from

document E1 that a thermo-mechanical treatment under oxygen or a gas mixture containing oxygen is beneficial for the surface appearance and that such a treatment leads to a reduction of the loss tangent (cf eg document E16). The person skilled in the art would, by performing tests wherein the oxygen content and the SME of the extruder are varied, easily (not inevitably) arrive at a loss tangent reduction within the claimed range. Document E38 provides some evidence for this. The person skilled in the art must of course also select a suitable extruder (since document E1 does not specify which extruder was used), for example the extruder used in document E16, see page 30, left column, penultimate paragraph.

In the provisional opinion of the board, no positive contribution to inventive step can therefore be seen in feature (ii).

With respect to distinguishing feature (i), it seems that the value of the loss tangent is not a parameter having a distinctive technical effect, cf point 15.3 above [of the communication of the board]. The patent specification does not give any explanation, why polyethylene having a loss tangent in the range claimed and which exhibit the bubble instability defect during conversion by blown extrusion, can be modified by the claimed process so that this defect is corrected.

It would therefore seem that the subject-matter of claim 1 of the main request does not involve an inventive step."

Since the appellants did not file a written reply with regard to this issue, there is no need for further

substantiation of this matter. Therefore, the board adopts this provisional opinion as its final judgment.

- 3.4 Consequently, the subject-matter of claim 1 of the main request does not involve an inventive step.

FIRST AUXILIARY REQUEST

4. *Ground for opposition under Article 100(c) EPC 1973 in combination with Article 123 EPC*

- 4.1 In the communication (cf point II above) the board was of the provisional opinion that the amendments to claim 1 of the first auxiliary request seemed to meet the requirements of Article 123(2) EPC.

Since respondents I to III did not file a written reply with regard to this issue, there is no need for further substantiation of this matter over and above the reasons given in point 18 of said communication. Therefore, the board adopts its provisional opinion mentioned above as its final judgment.

- 4.2 Claim 1 of the first auxiliary request therefore meets the requirements of Article 123(2) EPC.

5. *Ground for opposition under Article 100(a) EPC 1973 in combination with Article 56 EPC 1973*

- 5.1 Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the expression "0.15 to 0.5, preferably from 0.17" has been replaced by the expression "0.20" and in that the expression "15 to 70 %, preferably from 20 to 65 %" has been replaced by the expression "25 to 60 %".

5.2 The distinguishing features of claim 1 of the first auxiliary request with respect to claim 1 of the main request cannot lead to a different conclusion on inventive step than that of the main request, cf point 3 above.

A specific mechanical energy within the range of 0.20 to 0.35 kWh is largely known from document E16, see page 30, right column, lines 1 to 9. It is therefore obvious to the person skilled in the art, seeking a process for modifying a polyethylene in an extruder with a view to improving the properties of the polyethylene when it is being converted into film with respect to bubble stability, to perform experiments within the range known from document E16 with a view to optimize the bubble stability.

A loss tangent reduction within the range of 25 to 60 % is largely known from document E11, wherein the range is from 12 to 72 %. For the same reasons as in point 3.3, it is obvious to the person skilled in the art to perform experiments within the range known from document E11 with a view to optimize the bubble stability.

5.3 Consequently, the subject-matter of claim 1 of the first auxiliary request does also not involve an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



D. Meyfarth

M. Poock

Decision electronically authenticated