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Datasheet for the decision of 1 March 2018

Case Number: T 0445/15 - 3.3.03

Application Number: 06705536.8

Publication Number: 1849827

IPC: C08L23/10, C08F10/00, C08F4/643

Language of the proceedings: EN

Title of invention:
PROPYLENE POLYMER COMPOSITION AND ORIENTED FILM MADE THEREFROM

Patent Proprietor:
China Petroleum & Chemical Corporation
Beijing Research Institute of Chemical Industry,
China Petroleum &Chemical Corporation

Opponent:
Basell Poliolefine Italia S.r.l.

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
Amendments - broadening of claim (yes) prohibition of no reformatio in peius not complied with (main request)
Late-filed auxiliary requests - justification for late filing (yes) reaction to issues identified by Board (1st-7th axuialiry requests
Novelty - (yes)- not shown to required standard of proof
Inventive step - (no) - 1st-7th auxiliary requests

Decisions cited:
G 0009/92

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Case Number: T 0445/15 - 3.3.03

DECISION
of Technical Board of Appeal 3.3.03
of 1 March 2018

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(Opponent)

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Decision under appeal:

Interlocutory decision of the Opposition Division of the European Patent Office posted on 7 January 2015 concerning maintenance of the European Patent No. 1849827 in amended form.

Composition of the Board:

Chairman	D. Semino
Members:	M. C. Gordon
	R. Cramer

Summary of Facts and Submissions

I. The appeal of the opponent (appellant) lies from the interlocutory decision of the opposition division posted on 7 January 2015 according to which European patent number 1 849 827 could be maintained in amended form on the basis of the first auxiliary request, filed as auxiliary request 3 with letter of 10 October 2014 and renumbered during the oral proceedings.

II. The patent was granted with a set of 20 claims, whereby claim 1 read as follows:

"A propylene polymer composition comprising propylene random copolymer and propylene homopolymer; wherein the propylene random copolymer is a copolymer of propylene and ethylene, optionally comprising one or more alpha-olefins of C_4-C_{10}; the propylene polymer composition has an overall isotacticity index, as determined by nuclear magnetic resonance method, of greater than or equal to 96.5%, and an ethylene content of 0.3 to 0.8 wt%."

III. A notice of opposition against the patent was filed in which revocation of the patent was requested.

The following documents, *inter alia*, were relied upon by the opponent:

D1: EP-A-339 804
D2: Chûjö, R. et al, Two Site model analysis of ^{13}C n.m.r. of polypropylene polymerized by Ziegler-Natta catalyst with external alkoxysilane donors, Polymer, 1994, 35(2) 339-342
D3: WO-A-02/057342.

IV. The decision of the opposition division was based on a main request and a first auxiliary request corresponding respectively to the sets of claims filed as the auxiliary requests 1 and 3 with letter of 10 October 2014 and renumbered at the oral proceedings.

Claim 1 of the first auxiliary request read as follows:

"A propylene polymer composition comprising propylene random copolymer and propylene homopolymer; wherein the propylene random copolymer is a copolymer of propylene and ethylene; the propylene polymer composition has an overall isotacticity index, as determined by nuclear magnetic resonance method, of greater than or equal to 96.5%, and an ethylene content of greater than 0.3 to 0.8 wt%, wherein the propylene random copolymer and propylene homopolymer are prepared in the presence of a Ziegler-Natta catalyst having high stereo-selectivity and comprising a Ti-containing active solid catalyst component, and an organic aluminum compound as a co-catalyst component".

V. According to the decision, the main request did not meet the requirements of sufficiency of disclosure. The details of this objection are not of relevance for the present decision.
The first auxiliary request met the requirements of Articles 84 EPC and 123(2) EPC and of sufficiency of disclosure. It met the requirements of novelty over document D1 as it had not been shown that the polymers of D1 exhibited the required isotacticity index. In particular, calculations based on the polymerisation model of D2 were considered not to be applicable to the catalyst system of D1. Regarding inventive step, either of D1 or D3 could be considered as the closest prior art. Both documents were silent on the isotacticity

index feature and D3 disclosed higher ethylene content. The objective problem with respect to both documents was to provide compositions having low haze values and a high modulus. With respect to D1 there was no indication how to modify the composition thereof to arrive at the required isotacticity index. Moreover, the claimed ethylene content was considered non-obvious in the light of both documents, in particular because this would be expected to increase the haze. On that basis inventive step was acknowledged for all independent claims.

VI. The opponent filed an appeal against the decision maintaining objections *inter alia* of lack of novelty and lack of inventive step. Additional documents, designated D9-13 (renumbered by the Board as D13-D17) were submitted with the statement of grounds of appeal.

VII. In the rejoinder the patent proprietors (respondents) submitted a new main request and 11 auxiliary requests whereby the set of claims as maintained by the opposition division was designated as auxiliary request 1.

Claim 1 of the main request differed from the set of claims as upheld by the opposition division by deletion of the wording "greater than" from the definition of the range of ethylene content, so that the corresponding feature read as follows:

"an ethylene content of 0.3 to 0.8 wt%".

Further documents, designated D18-D20 were submitted.

VIII. The Board issued a summons to oral proceedings and a communication in which *inter alia* the question was raised whether the parameter "isotacticity index" expressed the same requirements in terms of polymer structure, in particular comonomer distribution, as set out in D1 and clarity of the expression "greater than 0.3 to 0.8 wt.%" present in all auxiliary requests was addressed.

IX. The respondents with letter dated 30 January 2018 filed as D21 a (further) declaration of a technical expert and further amended sets of claims as auxiliary requests 1-7 which corresponded to auxiliary requests 1,2,4,6,7,10 and 11 filed with the rejoinder with an amendment in the definition of the ethylene content (see below). Previously filed auxiliary requests 3, 5, 8 and 9 were renumbered as auxiliary requests 8-11.

The details of the auxiliary requests, insofar as relevant for the present decision are given in the following:

Auxiliary request 1: Claim 1 differed from claim 1 of the main request by defining the ethylene content as: "an ethylene content of greater than 0.3 and up to 0.8 wt%".

Auxiliary request 2: in addition to the amendment as for auxiliary request 1, claim 1 of auxiliary request 2 contained a more detailed definition of the polymerisation process as a two-step reaction and of the catalyst system, including the presence of a molecular weight regulator.

Auxiliary request 3: claim 1 differed from claim 1 of auxiliary request 1 by specifying in addition the presence of an organic silicon compound as an external electron donor.

Auxiliary request 4: claim 1 differed from claim 1 of auxiliary request 1 by specifying that the melt flow rate of the propylene random copolymer was lower than that of the propylene homopolymer.

Auxiliary request 5: claim 1 differed from claim 1 of auxiliary request 1 by specifying that the xylene soluble fraction at room temperature 25°C was less than 3.0 wt%.

Auxiliary request 6: claim 1 differed from claim 1 of auxiliary request 5 by specifying ranges for the melt flow rate of the propylene random copolymer and of the propylene polymer composition.

Auxiliary request 7: claim 1 corresponded to a combination of the respective claims 1 of auxiliary requests 2 and 6.

X. Oral proceedings were held before the Board on 1 March 2018. In the course of the oral proceedings the respondents withdrew auxiliary requests 8-11.

XI. The arguments of the appellant, insofar as relevant for the decision can be summarised as follows

(a) Late filed documents

It was requested that documents D18-D20 and D21 cited by the respondents not be admitted to the proceedings. The documents D13-D17 cited with the statement of grounds of appeal were directed to addressing matters raised in the decision, in particular the objection of lack of novelty.

(b) Main request - admissibility

The scope of protection conferred by claim 1 was broader than that of the set of claims as upheld by the opposition division due to the absence of the wording "greater than" in connection with the definition of the range of ethylene content. Thus the doctrine of no *reformatio in peius* was not complied with and the request was consequently not admissible. Even accepting that there was an error in the set of claims as upheld, it was not apparent that the amendment now made was the only possible correction.

(c) Auxiliary request 1

Regarding novelty, the compositions of D1, examples 1 and 5, disclosed all features of claim 1 with the exception of the isotacticity index. However D1 disclosed that the compositions had a high isotacticity, meaning that the isotacticity index was an inherent feature. This was confirmed by the calculations based on the simulation model of D2, the validity of which was confirmed by the documents submitted with the statement of grounds of appeal. In particular there was no evidence that the nature of the catalyst would affect the outcome of the calculation based on the model. Furthermore the polymerisation processes in D1 and the patent were largely identical, i.e. the same monomers and same type of catalyst meaning that it had to be assumed that the resulting products would not be distinguishable.

Regarding inventive step, D1 addressed the same problem as the patent in suit and taught the need to control the isotacticity of polypropylene and also explained how the regions of differing tacticity were to be distributed within the population of molecules of differing molecular weight. This teaching was identical to that of the patent in suit, the only difference being the absence the parameter isotacticity index $T_{overall}$. The problem set out in the patent in suit was to provide polymers suitable for use in biaxially oriented polypropylene (BOPP) films, which use required high modulus, and good mechanical properties whilst maintaining the other properties at a good level. The solution was to increase the isotacticity of the low molecular weight fraction whilst maintaining the level of total isotacticity, whereby the use of additives was not required. This balance of isotacticity was reflected by $T_{overall}$. D1 related to the same problem and provided a clear indication to the same solution in terms of the structure of the polymer. D1 disclosed a broader range of ethylene content than required by the operative claims, however there was no evidence for any technical effect associated with the claimed range of ethylene content, which had to be seen as arbitrary. The examples of the patent showed that the stiffness increased as $T_{overall}$ was increased. However it was a matter of general knowledge that this effect was a direct consequence of the increase in crystallinity which was in effect what $T_{overall}$ corresponded to. Examples 1 and 5 of D1 should be considered the closest prior art rather than the general disclosure since these exhibited the best secant modulus. In view of the aim of obtaining compositions with high stiffness there would have been no reason to look at other examples. Based on these examples as closest prior art, the solution of the patent of placing the ethylene in the high molecular weight fraction was obvious, this being precisely what D1 taught.

(d) Admittance of auxiliary requests 2-7

All these requests had been filed after the rejoinder to the statement of grounds of appeal. At least auxiliary request 2 could have been filed with the rejoinder.
It had not been demonstrated that the submission of the request(s) was justified or that these requests were *prima facie* suitable to overcome the objections.

(e) Auxiliary request 2

The added features did not provide any further differences over D1 since the document taught to use a sequential reactor system and to employ hydrogen, i.e. a molecular weight regulator. Any difference this feature might make in terms of the product was not reflected in the claim.

(f) Auxiliary request 3

The use of external donors was conventional in Ziegler-Natta catalysis. This was shown in D3 which described the same type of modifier compound as defined in the claim.

(g) Auxiliary request 4

No additional arguments were advanced.

(h) Auxiliary request 5

The limitation on xylene soluble content was simply another indication of the crystallinity. This was shown for example in D3 which confirmed that such levels of xylene solubles as defined were conventional.

(i) Auxiliary requests 6 and 7

No additional arguments were advanced.

XII. The arguments of the respondents, insofar as relevant for the decision, can be summarised.

(a) Late filed documents

D18-D20 had been submitted to address objections with respect to sufficiency of disclosure. D21 had been filed in response to observations made by the Board regarding the relationship of the disclosures in respect of tacticity of D1 and the patent in suit.

(b) Main request - admissibility

The set of claims as upheld by the opposition division contained an obvious error in the form of the presence of "greater than" in connection with the defined range of 0.3 to 0.8 wt% of ethylene. The skilled reader would immediately have recognised this error, and the necessary correction as now made would have been evident and hence imputed to the claim.

(c) Auxiliary request 1

D1 did not disclose the isotacticity index. Furthermore D1 contained so many variables that it would not be possible, to the required degree of certainty, to reproduce the teaching thereof. Regarding the model calculations of the appellant based on D2, the respondents had demonstrated a number of errors in the assumptions and calculations, none of which had been corrected. It was not even possible, based on the information given, to verify the calculations of the appellant meaning that the appellant had failed to discharge the burden of proof with respect to lack of novelty over D1.

Regarding inventive step, in an initial approach in the written submissions, it was considered that D1 was the closest prior art. D1 did not address the question of the tacticity of the polymer to the same extent or with the same depth of understanding as in the patent in suit. On the contrary, D1 took an oversimplified approach. This was explained in detail in D21.

However during oral proceedings the respondents departed from this position, arguing that D1 addressed a different problem, based on improving the properties of isotactic homopolypropylene which was achieved by including ethylene and preparing a copolymer. The present invention represented a more sophisticated development or refinement of the teaching of D1. Indeed the present invention requires modification of the teaching of D1, such that the invention of D1 could be seen merely as the starting point of the present invention.

The patent was concerned with improving the properties of BOPP by achieving a better balance of stiffness and softness. D1 started from conventional polypropylenes and attempted to improve their stiffness, arriving at BOPP. The upper limit of ethylene in D1 would result in a film which was too soft.

The evidence of the patent was that the specified ethylene content with a high overall isotacticity allowed to balance precisely the two competing requirements of stiffness and softness. D1 was silent on how to adjust the ethylene content, but maintain the overall isotacticity at a higher level. D1 also had no teaching as to the extent to which ethylene content was to be increased in order to obtain the required properties. At the priority date of the patent it was known that BOPP had deficiencies in terms of stiffness, which had at that time been addressed by employing additives. It was not known that this problem could instead be addressed by modifying the structure of the polymer, avoiding the need for additives. D3 disclosed a much higher level of ethylene than required in the patent in suit, the minimum level in D3 being the maximum of the patent. Thus D3 also provided no guidance to the claimed range of ethylene content or to $T_{overall}$.

The examples of the patent clearly showed the benefits of maintaining $T_{overall}$ in the claimed range on properties including xylene solubles, the content of which decreased with increasing isotacticity. The examples of the patent further showed that the teaching of D1, relating to a very low level of ethylene did not work. D1 could furthermore provide no guidance to the claimed solution, because it presented an incomplete and erroneous understanding of the effect of the disrupters and the ethylene content on the properties of the polymer composition. D1 merely focused on the total amount of molecules of disrupter units within the polymer without considering either the total number of occurrences of zones of disrupter or their placement within the polymer. Furthermore the mathematical treatment of the microstructure of the polymer composition in D1 was beset with errors and for this reason the document could not provide any clear teaching with respect to the structure of the polymer, as explained in D21.

The placement or location of ethylene in the molecule was significant. According to the patent this ethylene was located in the upper end of the molecular weight range. Furthermore with too much ethylene a crystallisable polymer would not be obtained. D1 did not recognise this interdependence of amount of ethylene and placement within the molecule. In contrast to D1 the patent identified a form of "sweet spot" where the properties were optimised.

(d) Admittance of auxiliary requests 2-7

The amendments made to these requests were directed to addressing an objection of lack of clarity raised in the communication of the Board. Otherwise they corresponded to requests filed with the reply to the statement of grounds of appeal.

(e) Auxiliary request 2

The presence of a regulator in the first reactor gave better knowledge and control of the MW of the product of that stage. This would not modify the isotacticity or the ethylene content, but would influence the overall structure and hence the properties of the final composition. In D1 the MW of the product of the first reactor was not monitored and the importance of the properties thereof or the need to control these was not recognised. Even if D1 did employ hydrogen, which was a molecular weight regulator, the extent to which this would modify the molecular weight or under what conditions any modifications would occur were not indicated. There was furthermore no indication in D1 to use a compound identified as a "molecular weight regulator" - hence even without an improvement this measure was not obvious.

(f) Auxiliary request 3

The organic silicon electron donor compound would influence the properties of the obtained polymer by affecting those parts of the catalyst which gave rise to racemic content. In the examples of the patent two new silicon electron donors were used which were shown to be highly effective. It was acknowledged that external electron donors based on silicon were common, but this was not part of the teaching of D1.

(g) Auxiliary request 4

The respondents relied on the arguments advanced for auxiliary request 2.

(h) Auxiliary request 5.

The specified xylene soluble content imposed a limitation on the properties of the polypropylene composition. There was no teaching in the prior art to control both the ethylene content and the xylene soluble content and no indication how to achieve this. D1 was silent on this aspect. An advantage arose in particular with respect to the use for food wrapping.

(i) Auxiliary requests 6 and 7

No additional arguments were advanced.

XIII. The appellant requested that the decision under appeal be set aside and that European patent No. 1 849 827 be revoked.

XIV. The respondents requested that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the main request filed with the response to the statement of grounds of appeal, or on the basis of one of auxiliary requests 1 to 7 filed with letter of 30 January 2018.

Reasons for the Decision

1. Admittance of documents filed during the appeal proceedings

The Board is satisfied that the documents D13-D17 were cited by the appellant in the statement setting out the grounds of appeal in order to address the findings of the decision with respect to sufficiency of disclosure (D13 and D14 relating to missing information in relation to the nuclear magnetic resonance method used to determine the overall isotacticity index) and novelty (D15 to D17 to support the applicability of the model of D2).

Documents D18-D20 of the respondents were likewise filed with the reply to the statement of grounds of appeal in direct response to the submissions made by the appellant (in particular with regard to the issues in D13 and D14).

These documents have been timely filed at the beginning of the appeal proceedings and can be seen as an appropriate reaction to the decision or the submissions of the opposing party. Moreover, it has not been rendered credible that any of these documents should have been filed at an earlier stage of the proceedings or that their filing represented an abuse of procedure.

Consequently the Board can identify no reason to make use of its power under Article 12(4) RPBA.

Documents D13-D20 are therefore in the proceedings.

As to D21, it was filed by the respondents to address technical question raised by the Board in its communication with regard to the teaching of D1 vs the teaching of the opposed patent.
In view of this, the Board finds it appropriate to make use of its discretion under Article 13(1) RPBA by admitting D21 to the proceedings.

2. Main request - admissibility - *reformatio in peius*

Claim 1 of the first auxiliary request before the opposition division, on the basis of which it was held that the patent could be maintained, defined the ethylene content as:

"greater than 0.3 to 0.8 wt%".

This wording therefore excluded the lower limit of 0.3 wt%, notwithstanding that the extent of the range, in particular the upper limit, was ambiguous due to the placement of the expression "greater than" before the definition of a range.

In this respect regarding the full extent of the range, the claim could have been understood as intending to define a range of greater than 0.3 and up to 0.8 wt%, as has indeed now been done in the auxiliary requests. Alternatively the claim could have been interpreted as denoting a range of values above 0.3 wt% and extending to above 0.8 wt%, or possibly even a range of values entirely above 0.8 wt%.

With the rejoinder to the statement of grounds of appeal an amended claim was submitted as claim 1 of the main request wherein the term "greater than" had been deleted, thus defining the range as "0.3 to 0.8 wt%" and hence including the amount of 0.3 wt% in the range.

The effect of the modification made is that, in contrast to the set of claims as upheld by the opposition division which excluded the lower limit of 0.3 wt%, this value is now encompassed by the claims, meaning that the scope of protection has been extended.

Since the patent proprietors are the respondents, and did not themselves file an appeal, they are primarily restricted in appeal proceedings to defending the patent within the extent in which it was maintained in the first instance proceedings (G 9/92, Reasons 16 with reference to Reasons 7 and 12 of the decision).

The main request therefore contravenes the principle of no *reformatio in peius*. In line with the findings of G 9/92 the presented amendments are not appropriate. For this reason the main request is not admissible.

In this respect, the Board cannot follow the additional argument of the respondents that the amendment results in the correction of an obvious error. Indeed, due to the ambiguity in the expression in claim 1 of the first auxiliary request before the opposition division, even if it is accepted that an error was present, the necessary correction was not unambiguous, so that it cannot be held that the claim would have necessarily been read by the skilled person in the manner as proposed by the respondents, resulting in the wording of the present main request. Indeed it appears that the only interpretation which could with any certainty not be discounted was that the limit of 0.3 was (intended to be) excluded from the claim - which is no longer the case in claim 1 of the main request.

3. Auxiliary request 1

3.1 Admittance

Claim 1 of this request defines the range of ethylene content as "greater than 0.3 wt% and up to 0.8 wt%", thus addressing the defect which resulted in the main request being rejected as inadmissible.

The appellant explicitly stated it had no objections to the admittance of this request to the proceedings.

On this basis the Board finds it appropriate to exercise its discretion under Article 13(1) RPBA by admitting auxiliary request 1 to the proceedings.

3.2 Novelty

D1 relates to polypropylene compositions consisting of a propylene homopolymer and a propylene/ethylene copolymer (claims 1 and 3).

According to examples 1 and 5 the compositions have 0.6 mol% of ethylene (page 10, Table 1), which corresponds to 0.4 wt%, i.e. within the range as defined in operative claim 1. The polymers of D1 are prepared using a Ziegler-Natta catalyst having a Ti solid catalyst component and an organic aluminium compound (D1, page 8, lines 27-29). Consequently, to the extent that the product-by-process feature of operative claim 1 can be regarded as characterising the subject-matter claimed, it does not provide a distinction over the disclosure of D1.

D1 does not disclose the overall isotacticity index.

In order to bridge this gap in the disclosure of D1, the appellant referred in particular to D2 which reports a method of modelling polymerisation systems consisting of a Ziegler-Natta system with external alkoxysilane donors and presented calculations based on this model.

The work of D2 is based on supported, i.e. two site, catalyst systems.

D1 does not disclose that the catalyst system thereof employs a support. Furthermore alkoxysilane donors are not present.

Thus D1 and D2 relate to different types of catalyst systems.

It is therefore not credible, and has not been shown, that the mechanism underlying the polymerisation studied in D2 would apply to the polymerisation in D1, meaning that it is cannot be assumed that the model developed in D2, and calculations based thereon would predict, even approximately, the outcome of the polymerisation of D1, let alone with the degree of precision and certainty required to establish whether there is a lack of novelty.

Due to these uncertainties the case of lack of novelty based on the application of the model of D2 to the polymerisation of D1 is not proven.

The appellant has also relied on the argument that the polymerisation processes in D1 and the patent in suit were largely identical, making it inevitable that the products would be indistinguishable.

However no evidence to support this position has been submitted. Rather this objection relies on supposition and speculation.

In view of the doubts regarding the applicability of the calculations presented to demonstrate the properties of the polymers of D1 and the absence of any evidence of the properties of the polymers of D1 in terms of the overall isotacticity index, the Board can come to no other conclusion than that the objection of lack of novelty in the light of the disclosure of examples 1 and 5 of D1 has not been proved.

The requirements of Article 54 EPC are therefore satisfied.

3.3 Inventive step.

3.3.1 The patent in suit, the technical problem

The patent is directed to propylene polymer compositions in particular suitable for producing biaxially oriented films (BOPP) (paragraph [0002]). In paragraph [0004] it is explained that in order to meet the requirements for film production the polymer must exhibit good tensile strength and excellent high temperature stretching property. It is explained that, generally, lower isotacticity index and melting point are beneficial for film processing and forming, but that this results in reduced mechanical properties such as tensile strength and stiffness (patent, paragraph [0004], lines 21-25).

Thus, as set out in paragraph [0006] of the patent the problem addressed was to provide propylene polymer compositions for producing BOPP which can provide a better balance of high temperature stretching properties and physical properties of the film.

3.3.2 Closest prior art

Both D1 and D3 have been proposed as forming the closest prior art.

D1 is directed to modified polypropylene, a process for producing it and articles prepared therefrom (page 2, lines 3-6). According to page 2, lines 35-38, advantageous properties of highly isotactic homopolypropylene are high tensile strength, hardness and melting point, whilst balanced against these are undesirable properties such as brittleness, low impact strength and difficult processability in particular with respect to film applications regarding biaxial stretching of the polymer. D1 is directed to addressing this problem by modifying the highly isotactic polypropylene (page 2, lines 45-52, in particular 47-49) to "plan" the composition, molecular weight distribution and crystallinity. The aspects of orienting the polymer and producing a film are discussed at page 3, lines 17 and 22 and it is further stated that the modified polypropylene is especially suited for oriented film applications (page 4, lines 48, 49).

The respondents, after initially (in the written submissions) considering D1 as representing the closest prior art changed their position during the oral proceedings before the Board, and disputed that D1 and the patent addressed the same problem since the relative starting points were different. Whereas D1 was based on improving the properties of homopolypropylene, the patent in suit started from, in effect, the polymers developed according to D1. The respondents furthersubmitted that the problem to be solved with respect to D1 was to provide BOPP which had a better balance of softness and stiffness. However this is precisely the same problem as set out in D1, as follows from the statements of problem at page 2, lines 35-38 and 45-52.

Accordingly both D1 and the patent in suit address the same problem, notwithstanding that they start from different stages of development of propylene based polymers. To follow the view of the respondents regarding the relevance of D1 or the suitability thereof as closest prior art would lead to the unreasonable conclusion that any prior art document would have to be disqualified as the closest prior art if, as is normally the case, it related to an earlier stage of development of the technology in question.

D3 is directed to BOPP films based on polypropylene polymer or polymer composition (claim 1; page 1, lines 1 and 2). According to page 1, lines 14-28 the invention of D3 consisted of BOPP wherein at least one layer comprises a propylene polymer containing at least 0.8 wt% of ethylene.

Thus both D1 and D3 are directed to, if not precisely the same problem, then to a problem that is closely related to that of the patent in suit, and consequently either of these documents can be considered representative of the closest prior art.

As the Board comes to the conclusion that there is lack of inventive step starting from D1 as the closest prior art, an analysis starting from D3 is superfluous.

3.3.3 Distinguishing feature

As established above with respect to novelty, the subject-matter of operative claim 1 is distinguished from the disclosure of D1 by the specified overall isotacticity index.

3.3.4 Technical effect

The examples of the patent are divided into two parts. In those examples relating to production of a polymer a dual loop reactor system is employed as explained in example 1.

In Table 1 two comparative examples are presented whereby comparative example 1 relates to a propylene homopolymer. Comparative example 2 employs the same catalyst system as in inventive example 3 and differs from the inventive examples 1-4 in that the component of the first stage is prepared in the presence of a 20-fold higher amount of hydrogen, resulting in a polymer with lower molecular weight (shown by the higher MFR) than that of examples 1-4. The isotacticity index is 95.5, i.e. below the minimum of the claim, whereas the ethylene content is 0.43 wt%, within the range of the claim and identical to that of inventive example 1.

The MFR of the final polymer of comparative example 2 is approximately the same as that of the inventive examples 1-4, which, as a consequence of the difference in the polymer of the first stage, confirms that also the properties of the second stage polymer of this composition are necessarily significantly different to the corresponding component of the inventive examples. Due to the difference in the constitution of the two component polymers, in particular in terms of molecular weight, comparative example 2 is not suitable to demonstrate whether any effect arises solely as a result of the isotacticity index. Nor are the examples of Table 1 suitable to demonstrate whether any effect is associated with the ethylene content.

This conclusion is not changed when taking into account the additional data provided on pages 20 and 21 of the rejoinder to the statement of grounds of appeal. These data are based on the same compositions as given in Table 1 of the patent, but report further properties.

The second set of data of the patent in suit set out in Table 2 relates to commercial products. Although certain properties are given (ethylene content, $T_{overall}$) it is not explained how, in other respects, these are similar to or differ from the inventive examples 1-4. Hence these examples cannot contribute to establishing the objective technical problem to be solved with respect to D1.

In the light of the evidence of Table 1, in association with the additional data provided in the rejoinder to the statement of grounds of appeal the objective technical problem with respect to D1 has to be formulated as the provision of further compositions for BOPP films, exhibiting a good balance of properties, in particular stiffness and flexibility.

3.3.5 Obviousness

With respect to the tacticity of the polymer and influence thereon of the underlying polymer structure, in respect of monomer placement in D1 it is stated in the passage bridging pages 3 and 4 that the chain disrupters are added to a highly isotactic polymer so as to be incorporated exclusively in the high end of the molecular weight distribution.

This is precisely the approach foreseen in the patent as set out in paragraph [0007] where it is stated that the isotacticity of the polymer having relatively lower molecular weight is increased to keep the overall isotacticity at the same level. The only way to achieve this is to have a relative increase of atacticity in the higher molecular weight portion of the polymer while using a highly isotactic homopolymer which is what D1 teaches.

Thus the patent and D1 describe qualitatively the same structure of the polymer in terms of monomer distribution and isotacticity of the homopolymer.

The respondents submitted that the definition of the overall isotacticity index ($T_{overall}$) was the result of a deeper and more differentiated understanding in respect of how not only of the total number of disrupter units (ethylene comonomer units) but also their placement within the polymer influenced the outcome in terms of the properties of the polymer.

In particular it was argued, especially with respect to the analysis provided in D21, that the mathematical treatment in D1 was incorrect or at least incomplete, failing to differentiate between the total number of molecules of disrupters and their placement within the polymer, i.e. how many instances of regions of disrupters were present regardless of the number of molecules therein.

However, regardless of the extent to which D1 was able to provide a detailed understanding or correct mathematical treatment of the structure of the polymer, as explained above, the underlying teaching of D1 and the patent regarding the location of disrupters within the polymer and the high isotacticity of the homopolymer is the same.

Even accepting that $T_{overall}$ as determined according to the patent provides a more differentiated and correct (mathematical) description of the polymer than does D1 and the above conclusions with respect to novelty notwithstanding, there is no evidence that the teachings relating to the underlying structure of the polymers of D1 and the patent in suit are in fact distinguished or that the mathematical definition employed in the patent, as manifested by the definition of $T_{overall}$ necessarily relates to polymers not falling under the general disclosure of D1 and is reflected by the properties of the polymer, i.e. results in a technical effect not shown by the general class of polymers of D1.

In the light of the foregoing it would appear that all that the patent provides is a more elaborate and detailed description of polymers which fall within the known group of polymers disclosed in D1. This definition or description however does not necessarily, and has not been shown to, relate to a particular subset of polymers with respect to the disclosure of D1 which subset exhibits a particular non-obvious balance of features or properties not shown by the generality of the disclosure of D1.

Consequently an inventive step has to be denied.

4. Auxiliary requests 2-7 - admittance

Auxiliary requests 2-7 differ from auxiliary requests 1, 2, 4, 6, 7, 10 and 11 as filed with the rejoinder to the statement of grounds of appeal by amendment of the definition of the range of ethylene content as in auxiliary request 1 (see above).

While this amendment is an appropriate response to a clarity objection raised by the Board (see point VIII, above) and cannot speak against the admittance of the requests (see point 3.1, above) the additional amendments were presented by the respondents at the earliest possible opportunity in appeal as a reaction to the many objections of the appellant.

On this basis, the Board finds it appropriate to exercise its discretion under Article 13(1) RPBA to admit auxiliary requests 2-7 to the proceedings.

5. Auxiliary request 2 - inventive step

Claim 1 differs from claim 1 of auxiliary request 1 by a more detailed specification of the process in the product-by-process part of the claim. In particular it is specified that the polymerisation takes place in a two-step reaction and that a molecular weight regulator is employed.

Neither of the additional features provides further differences over the process disclosed in D1.

Firstly in the examples of D1 a two reactor system is employed (page 8, lines 7 and 16, referring to a "first" reactor and a "second" reactor).

Furthermore hydrogen is present in the monomer feed (page 8, lines 7 and 17). Hydrogen serves as a molecular weight regulator. In this connection it is immaterial, as submitted by the respondents, that D1 does not identify the hydrogen as a "molecular weight regulator". This effect is inherent to the use of hydrogen in such a polymerisation.

Correspondingly the same conclusions as for the main request apply, leading to the finding that the subject matter of auxiliary request 2 does not meet the requirements of inventive step.

6. Auxiliary request 3 - inventive step

Claim 1 differs from claim 1 of auxiliary request 1 by the feature that an organic silicon compound is present as an external electron donor.

There is no evidence in the patent that the presence of an external electron donor provides any effect on the properties of the polymers. The argument of the respondents that the specific compounds identified in the patent (in paragraphs [0045] and [0048]) were novel examples of this type of component is not relevant, insofar as the claims are not limited to such specific compounds.

In view of the absence of any evidence for a technical effect detectable on the polymers arising from the incorporation of these components in the process of making the polymers which are the subject-matter of the claim, the objective problem to be (further) solved by this feature has to be formulated as the provision of further polymers based on those of D1.

The use of electron donors of the generality as claimed is known in the relevant technical field as demonstrated by D3, page 5, fifth-third lines from the bottom.

Consequently the further feature of claim 1 of auxiliary request 3 has to be seen as an obvious solution to the - further - problem indicated above, leading to the conclusion that an inventive step has to be denied.

7. Auxiliary request 4 - inventive step

Compared to auxiliary request 1, claim 1 of auxiliary request 4 differs by specifying that the melt flow rate of the propylene random copolymer is lower than that of the propylene homopolymer.

The definition of the relative melt flow rates does not introduce any additional distinguishing feature with respect to the teaching of D1 (the homopolymer representing the low end of the molecular weight distribution - see section 3.3.5, above), meaning that the conclusions as reached for auxiliary request 1 also apply to auxiliary request 4. Indeed both parties relied on the respective submissions made for auxiliary request 1 when discussing auxiliary request 4.

Auxiliary request 4 does not meet therefore the requirements of inventive step.

8. Auxiliary request 5 - inventive step

Compared to auxiliary request 1 claim 1 of auxiliary request 5 contains an additional feature, namely the definition of the xylene soluble content.

As submitted by the appellant, and not disputed by the respondents, the xylene soluble content is representative of the crystallinity, in that crystalline parts of the polymer are not soluble in xylene. Thus this feature amounts to nothing more than a further specification of what is (intended to be) represented by $T_{overall}$. There is no evidence that any technical effect is associated with the specified xylene soluble content. Furthermore it is apparent from D3, page 12, table 1 that the said xylene solubles range is conventional in this type of polymer compositions.

Consequently no inventive step can be recognised for the subject-matter of auxiliary request 5.

9. Auxiliary request 6 - inventive step

Claim 1 differs from claim 1 of auxiliary request 5 by specifying additionally the melt flow rates of the two polymer components in terms of their numerical ranges.

No additional arguments were submitted by the respondents in respect of this request.

In these circumstances the Board has no reason to come to a different conclusion in resect of inventive step, leading to the finding that the requirements are not satisfied.

10. Auxiliary request 7 - inventive step

Claim 1 corresponds to a combination of the subject-matters of claim 1 of auxiliary requests 2 and 6.

Insofar as no additional arguments were advanced by the respondents, the Board has no reason to come to any conclusion other than that the subject-matter of auxiliary request 7 likewise does not meet the requirements of inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

Beschwerdekammern des Europäischen Patentamts
Boards of Appeal of the European Patent Office
Chambres de recours de l'Office européen des brevets

L. Stridde D. Semino

Decision electronically authenticated