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Datasheet for the decision of 22 April 2008

Case Number: T 0826/05 - 3.3.03

Application Number: 98933129.3

Publication Number: 0996651

IPC: C08F 210/02

Language of the proceedings: EN

Title of invention:
Broad MWD, compositionally uniform ethylene interpolymer compositions, process for making the same and article made therefrom

Patentee:
THE DOW CHEMICAL COMPANY

Opponent:
Borealis Technology OY

Headword:
-

Relevant legal provisions:
EPC Art. 83, 100(b), 111(1)

Relevant legal provisions (EPC 1973):
EPC Art. 100(b)

Keyword:
"Opposition grounds - insufficiency of disclosure (no)"
"Decision re appeals - remittal (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0826/05 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 22 April 2008

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Decision under appeal:
Decision of the Opposition Division of the European Patent Office dated 27 April 2005 and posted 9 May 2005 revoking European patent No. 0996651 pursuant to Article 102(1) EPC 1973.

Composition of the Board:

Chairman: R. Young
Members: A. Däweritz
C.-P. Brandt

Summary of Facts and Submissions

I. The grant of European patent No. 0 996 651 in respect of European patent application No. 98 933 129.3, filed on 2 July 1998 as the international patent application PCT/US98/13854 and claiming the priorities of 21 July and 25 October 1997, respectively, of two earlier applications in the USA (US53263 P and US63390 P, respectively), was announced on 4 September 2002 (Bulletin 2002/36). The patent was granted with 19 claims. Its independent claims read as follows:

1. A process and ethylene polymerization system for making an ethylene polymer composition,
the system comprising at least two injection points and at least two polymerization reactors, each reactor having a reaction stream or zone wherein at least one catalyst system and make-up feed is injected and wherein the make-up feed comprises ethylene and optionally at least one unsaturated comonomer,
the process comprising continuously operating the at least two polymerization reactors and separately injecting the catalyst system and the make-up feed into the reaction stream or zone of at least one reactor,
the composition comprising ethylene interpolymerized with at least one unsaturated comonomer and characterized as having:
a) a melt flow ratio, I_{10}/I_2, from 8 to 10.4,
b) a M_w/M_n of greater than 4 as determined by gel permeation chromatography,
c) a melt index, I_2, from 0.1 to 10 gram/10 minutes,
d) a composition density less than 0.945 gram/cubic centimeter, and
e) based on the total weight of crystallizable polymer portions, a weight percent at the dominant peak temperature above 75°C, as determined using crystallization analysis fractionation in the range of 20 to 100°C, equal to or greater than the mathematical product of $1.7946 \times 10^{-28} \times 10^{(31.839 \times \text{composition density})}$ for composition density in grams/cubic centimeter.
2. A polymer composition comprising ethylene interpolymerized with at least one unsaturated comonomer, wherein the composition is characterized as having:
a) a melt flow ratio, I_{10}/I_2, from 8 to 10.4,
b) a M_w/M_n of greater than 4 as determined by gel permeation chromatography,
c) a melt index, I_2, from 0.1 to 10 gram/10 minutes,
d) a composition density less than 0.945 gram/cubic centimeter, and
e) based on the total weight of crystallizable polymer portions, a weight percent at the dominant peak temperature above 75°C, as determined using crystallization analysis fractionation in the range of 20 to 100°C, equal to or greater than the mathematical product of $1.7946 \times 10^{-28} \times 10^{(31.839 \times \text{composition density})}$ for composition density in grams/cubic centimeter.
3. A fabricated article comprising the ethylene interpolymer composition defined in Claim 2.

The remaining claims 4 to 19 were dependent claims.

In this decision, references to passages in the patent in suit as granted will be given underlined in squared brackets, eg [Claim 1], [0001] and [Example 1]. "EPC" refers to the revised text of the EPC 2000, the previous version is identified as "EPC 1973".

II. On 3 June 2003, a Notice of Opposition (NOOP) was filed according to Articles 99 and 100 EPC 1973, in which, the following grounds for opposition were invoked and substantiated: insufficient disclosure according to Article 100(b) EPC 1973, lack of novelty and lack of inventive step according to Articles 100(a), 52(1), 54 and 56 EPC 1973, respectively.

(1) Five pieces of prior art und two documents relating to additional experiments ("D5") and to parameters, respectively, were cited against the claimed subject-matter. During the further opposition proceedings, the Patent Proprietor additionally filed Annexes A1 to A3, and the Opponent submitted a further experimental report ("D8"), allegedly a repetition of Example 2 of

D3: WO-A-95/25758.

(2) In particular, the Opponent argued with regard to Article 100(b) EPC 1973 that, whilst the polymer composition specified in [Claim 1] could, according to the patent in suit, be produced in many ways, eg by using a Ziegler-Natta (Z-N) catalyst, a single site catalyst or a chromium catalyst, and whilst the [examples] disclosed how the compositions could be produced by using a Z-N catalyst, neither the claims nor the specification, including the [examples], gave the person skilled in the art any guidance on how to produce the polymer compositions by using a single site catalyst or a chromium catalyst. Moreover, the specification gave, according to the Opponent, no idea on which reactor split to use, which molecular weights to produce in each reactor and which comonomer content the polymer produced in each reactor should have. Nor would the document give any guidance in which reactor

conditions the person skilled in the art should operate the reactors to produce the polymer components having the desired properties.

Only in [0079], some single site catalysts had been mentioned. An attempt to operate the process in the conditions disclosed in the [examples] for Z-N catalysts but replacing these catalysts by a metallocene catalyst would, as demonstrated in Opponent's experiments of "D5", inevitably lead to the formation of a polymer which would not meet all the features required in [Claim 1]. Moreover, "Claims 1 and 2 comprise a broad range of densities between 0.935 and 0.945 g/cm^3, which cannot be produced because they require that more than 100 % of the polymer would crystallise above 75 °C. Therefore, the patent lacks any disclosure on how to produce polymers in that density range and fulfilling the requirements of the Claims. Consequently, Claims 1 and 2 contravene Article 83 EPC." (NOOP: pages 3 to 5).

(3) These allegations and arguments of the Opponent were, however, disputed by the Patent Proprietor, who believed that there was adequate information for those skilled in the art to produce polymers meeting the claim limitations, even when using any disclosed catalyst other than Z-N catalysts. One skilled in the art would recognise how to modify the conditions in order to obtain a suitable polymer. This would be well-known in the art. Therefore, it would not be necessary to give the person skilled in the art any further guidance. The report "D5" would, in the opinion of the Patent Proprietor, only demonstrate that it had been possible to find reaction conditions in which products were obtained not having the required properties.

However, it would have been no problem for the person skilled in the art, who had wanted to produce suitable polymers, to adjust the conditions accordingly. Whilst accepting the Opponent's argument that the calculation of feature e) reached 100% for densities of 0.935 to <0.945 g/cm^3, the Patent Proprietor held a correction of the claims in this respect not to be necessary.

(4) In further submissions, both parties disputed the arguments of the respective other party. Moreover with its letter dated 28 February 2005, the Opponent filed experimental report "D8" (section II(1), above) to show that the repetition of Example 2 of D3 resulted in a polymer composition meeting all the claimed features.

(5) The results of this report were, however, in a further letter dated 22 April 2005, contested by the Patent Proprietor, because the experiment had not been a true repetition of Example 2 of D3, but had been carried out using hindsight knowledge. With this letter, the Patent Proprietor also filed three Auxiliary Requests, the details of which are not relevant for this decision.

III. By a decision announced at the end of oral proceedings on 27 April 2005 and issued in writing on 9 May 2005, the Opposition Division revoked the patent on the basis of the finding that the ground for opposition mentioned in Article 100(b) EPC 1973 prejudiced the maintenance of the patent in suit. Furthermore, the Opposition Division held that there had been no need to address the ground for opposition under 100(a) EPC 1973, because the Proprietors had not filed any request that fulfilled the requirements of Art.83 EPC 1973.

(1) All the reasons for the decision under appeal focused on Process [Claim 1] (section I, above).

(2) In the Opposition Division's view, the description of the patent in suit did not provide much additional information on how the parameters a) to e) could indeed be achieved in accordance with [Claim 1]. "Paragraph [0074] indicates that 'any kind of polymerization method and procedure known in the art' can be used 'provided that the operations, reactor configurations, catalysis systems and the like are selected, employed and carried out to indeed provide the novel composition'. ... and any known catalyst system useful for polymerizing olefins can be used, including Ziegler-Natta, chromium and single site catalysts ([0079])." (No. II.2.1).

(3) Then the Opposition Division pointed out (i) that, only five out of nineteen [examples] in fact fulfilled all the parameters a) to e), (ii) that exact process conditions had only been specified for [Examples 1 to 3], of which only the product of [Example 2] met the requirements of [Claim 1], and that (iii) the remaining four examples within the scope of [Claim 1] had apparently been manufactured using essentially the same polymerisation system as in [Example 2] (No. II.2.2).

(4) In view of the results of the [examples], the Opposition Division drew the conclusion, that in these examples "a whole bench of process features are varied, most of the time not independently" and that the person skilled in the art did not get any reliable guidance from the [examples], how to perform the claimed process in order to obtain the claimed, apparently interdependent parameters. The modification of the

process features disclosed (ie hydrogen and comonomer flows, the site of the comonomer introduction, the polymer split, the catalyst injection and the ethylene conversion) would not, however, systematically lead to these parameters. Neither the common general knowledge, nor the patent in suit would provide sufficient technical guidance according to which the person skilled in the art could identify all the suitable process features leading to the claimed parameters without undue burden (No. II.2.3).

(5) Since there were serious doubts that the person skilled in the art would be able to perform the claimed process on the whole scope of [Claim 1] without undue burden, the patent would fail to disclose any technical concept fit for generalisation, which would enable the person skilled in the art to achieve the claimed parameters without undue difficulty within the whole ambit of the process claim (No. II.2.4).

(6) Then, the Opposition Division took the view that, whilst the above reasoning applied to the process in which Ziegler Natta catalyst systems had been involved, this reasoning would *a fortiori* apply to the process in which other kinds of catalysts were used, for which, however, the patent in suit provided no guidance at all. Thus, in particular, the little guidance the [examples] provided was completely irrelevant for metallocene catalysts, which had generally been known to behave, in comparison with Z-N catalysts, differently in respect of all the process modifications mentioned in point II.2.3 of the decision under appeal. As the Opponents had demonstrated in "D5", a known process based on the general knowledge of the skilled worker and employing a metallocene catalyst system had failed to produce the

desired product according to [Claim 1], although variations of isolated process features were executed to meet the required parameters (No. II.2.5).

(7) With regard to the Auxiliary Requests 1 to 3, the Opposition Division took the view that, despite the respective limitations to their claims, the above findings were applicable *mutatis mutandis* to these requests. Consequently, the Opposition Division saw no need to consider the further objections raised by the Opponent under Article 100(a) EPC 1973 and revoked the patent in suit, because its maintenance was prejudiced by Article 100(b) EPC 1973.

IV. On 30 June 2005, a Notice of Appeal was filed against this decision by the Patent Proprietor/Appellant, who requested that the decision under appeal be set aside and the patent in suit be maintained as granted (Main Request) or in the amended form on the basis of Auxiliary Request 1 to 3 as submitted on 22 April 2005 (section II(5), above). The prescribed fee was paid on the same date.

V. In the Statement of Grounds of Appeal (SGA) received on 16 September 2005, the Appellant disputed the reasons for the revocation of the patent in suit, pointed out, that the objection under Article 100(b) EPC 1973 had initially been bought forward by the Opponent only with regard to the use of catalysts in the claimed process other than Z-N catalysts, and cited the respective passage from the NOOP: "However, the examples only disclose how the compositions can be produced by using a Ziegler-Natta catalyst." (SGA: page 3, last line).

Furthermore, in order to support its case, four additional documents were submitted, including

D9: B.A. Krentsel, et al., "Polymers and Copolymers of Higher α-Olefins", Hanser Publishers, Cincinnati, 1997, pages 263 to 267 and 301 to 307.

(1) The Appellant argued that the description contained a detailed example ([Example 2]) teaching all the process parameters necessary for carrying out the process in such a way that a product having features a) to e) had been obtained. Furthermore, the specification would have contained a sufficient number of product examples to show that the claimed process worked and that the claimed products could be obtained by way of this process, even though some of the examples did not fall within the claimed ranges of features a) to e).

Then the Appellant discussed each of these features individually in order to show that it was absolutely no problem for the skilled person to adjust the reaction conditions so that these features would be within the claimed range and presented the following arguments:

(2) According to [0115], the melt flow ratio (MFR) I_{10}/I_2 (feature a)) and the melt index I_2 (feature c)) could be adjusted by the hydrogen flow.

The MFR was related, though not in a linear manner, to the polydispersity (molecular weight distribution) M_w/M_n (feature b)). This would be basic knowledge as verified by D9 (part 8.5 on page 265).

(3) The density (feature d)) would be related to the amount of comonomer. As was well known, the density could be decreased by increasing the amount of comonomer.

(4) According to D9 (part 8.7.2.1, pages 302 to 304), it would have been known to the person skilled in the art that the homopolymer and higher density copolymer fractions of a polyethylene were the crystallisable portions thereof. In a multi-reactor system, increasing the crystallisable fraction in the predominant peak would correspond to decreasing the amount of comonomer in the reactor producing most of the polymer.

With reference to the polymers of [Examples 1 and 2] as shown in [Tables 1 and 5], the Appellant pointed out that the amount of the crystallisation fraction was significantly increased when less octene was available in the second loop reactor, which contributed the larger part of the polymer. This would have confirmed the knowledge in the art that less comonomer resulted in more homopolymer and dense copolymer and, therefore, a "higher crystallization fraction".

(5) Because of the fact that the effective amounts or ratios of reactants to reach exact targets (ie specific properties of the product) varied with the specific reactor system, reaction conditions, catalyst, cocatalyst and introduction of each reactant, the art was, according to the Appellant, used to speak in terms of controlling a property of the product by controlling one or more specific aspects of the process rather than giving numerical amounts or ratios of the ingredients. However, the general effect of eg lowering the density by increasing the amount of comonomer, or eg raising the molecular weight by reducing the relative amount of hydrogen could be "observed over the range of reactors, catalysts and conditions" (No. 3.1.5). In summary, (i) once the target had been set of obtaining an ethylene polymer composition having the parameters according to

features a) to e) and (ii) having the disclosure of the process parameters of [Example 2] (and preferred process conditions as disclosed in [0114] to [0117]), the skilled person would have perfectly been able to carry out the invention. In other words, the skilled person would have been able to adjust the conditions of the process in order to obtain products within the claimed ranges, when, but only when, the parameters of the polymers had been established.

(6) Furthermore, the Appellant criticised the additional experimental report "D8" of the Opponent, in that "**The Opponent himself adjusted the conditions taught in D3 to obtain a product as claimed in the patent**" (item 3.2). The Appellant referred to a number of process features in this respect. Thus, (item 1.) D3 taught no specific example of a procatalyst, but merely referred very broadly to another document. Nor had the titanium compound or the alkyl aluminium chloride, which had been used to make the procatalyst, or the ratio, in which they had been used, been further specified. D3 would have also been silent about the types and the amounts of magnesium halide and of organomagnesium compound, respectively. Furthermore, (item 2.) the Opponent would have selected a particular cocatalyst on the basis of hindsight. Still further process details, allegedly chosen by the Opponent, were the sequence and way of addition of individual components and the amount of the diluent.

(7) The objection in the decision under appeal concerning the used of catalyst other than Z-N catalysts was disputed by the Appellant by referring to the explanations in [0079] and [0075].

(8) Therefore, the Appellant was of the opinion that the claimed subject-matter had been sufficiently disclosed.

VI. The arguments of the Appellant were disputed by the Respondent (Opponent) in its letter dated 23 March 2006, and the Respondent fully supported the decision under appeal. Thus, the Respondent pointed out that, as shown by [Comparative Example 4] as described in [0093], single-site catalysts would not provide the claimed products, and it contested the criticism of the Appellant raised against its experimental report "D8".

VII. On 28 December 2007, the parties were summoned to oral proceedings to be held on 22 April 2008. Annexed to the summons, a Communication was sent out reflecting the provisional view of the Board following a preliminary examination of the case.

In view of the fact that the decision under appeal had dealt exclusively with the objection of insufficient disclosure raised by the Opponent/Respondent under Article 100(b) EPC, the Board informed the parties in this Communication, that it would also limit its considerations to this ground for opposition, so that the result of these appeal proceedings would be either the remittal to the first instance for further examination of the other cited grounds for opposition or the dismissal of the appeal.

Nevertheless and for the reason of completeness, the Board added some preliminary, provisional remarks concerning (i) the claims on file as a whole and (ii) its view at that time concerning the above objection.

VIII. In its letter dated 11 March 2008, the Appellant confirmed that it maintained its previous requests and submitted a further Auxiliary Request 4. In the items 3.1 to 3.3 of the letter, it additionally sketched out shortly the amendments in the claims before grant which had resulted in some inconsistencies between the claims and the description. Moreover, it argued that the different values as displayed in different tables of the specification for the measurement of a given parameter in a given example had been obtained from different samples of the same specimen. Anyhow, these differences would have been within an acceptable variation range, ie within the standard deviation.

(1) In a still further letter dated 25 March 2008, the Appellant additionally filed Auxiliary Request 5, which was later corrected by fax dated 18 April 2008, and a new version of the specification containing a number of amendments in its description to remove those inconsistencies mentioned in items 3.1 to 3.3 of the above letter of 11 March 2008.

(2) Moreover, the Appellant presented, in its letter of 25 March 2008, further arguments for its position that the patent in suit provided sufficient information on how the properties according to parameters a) to e) of [Claim 1] could indeed be achieved and why at least five examples fulfilled the requirements of the claims. Furthermore, the Appellant saw its position, that the claimed subject-matter had sufficiently been disclosed, confirmed by the experimental report "D8" of the Respondent, who had, in the Appellant's view, been well aware of how to adjust certain properties and values of the copolymer to be within the range of the claims, and it referred again to conditions and polymer properties

which had been used in the process of the alleged reworking, but which could not actually have been taken from D3. And it concluded: "Completely in line with the position of Patentee, Opponent managed to adjust the process to provide the desired results and the balance of properties of the inventive copolymers.". Rather the Respondent had used "a lot of common knowledge in the field to supplement for disclosure that could not be taken from the description of example 2 of D3." (page 10 of the letter).

IX. With respect to Auxiliary Request 5, the Respondent was of the opinion, in its letter dated 11 April 2008, that it met neither the requirements of Article 123(2) EPC, nor those of Article 84 EPC or Rule 80 EPC. Therefore, it should not be admitted into the proceedings.

Furthermore, the Respondent maintained its objection under Article 100(b) EPC/EPC 1973 and argued that it would have been impossible for the person skilled in the art to realise that it would have been essential eg to inject the make-up octene into the first reactor, "in order to solve the object of the patent". Nor could the essentiality of this process feature be derived from the analysis of the Examples. Nor were the claims limited to this apparently crucial process feature. "If anything, then the information about the point of injection is hidden in the Examples, which is contrary to the intention of Art. 83, which intends to avoid that a patent is granted if at the other hand a clear and complete disclosure of the invention is withheld." (pages 3/4, item 6.1.).

The Respondent also pointed again to the inconsistency between the requirement in feature e) and the upper

limit of density range, as conceded by the Appellant. Hence, even the subject-matter of Auxiliary Requests 2 and 3 could not be performed in the whole claimed range.

Finally the Respondent criticised that the Appellant had not addressed at all that single-site catalysts were still encompassed by the claims, which behaved very differently from Z-N catalysts. It concluded that in view of the absence of any example using this different catalyst system in the patent in suit and in view of the results in experimental report "D5", it would be apparent that the person skilled in this art could not produce a composition with all the features of the claim when using a single-site catalyst.

Since neither of Auxiliary Requests 4 and 5 played any role in the further appeal proceedings, their details are not relevant for this decision.

X. The oral proceedings took place on 22 April 2008. After the introduction by the Chairman, who reminded the parties that the subject-matter to be discussed would be limited to the question of the alleged insufficiency of disclosure, both parties reiterated, in essence, their previous arguments as submitted in writing. Therefore, only those points as presented during the hearing, which have been of particular importance for this decision, are summarised herein below.

(1) At the outset of the presentation of its arguments, the Appellant referred to [0008], sentences 1 and 2, and [0001], first sentence. According to these passages, there was a need for an improved ethylene interpolymer composition and for a process for making it, because "no known ethylene interpolymer composition provides

the desired balance of good to excellent processability, melt fracture resistance, melt strength and toughness as demonstrated by high tear and impact resistance". As a solution, the patent in suit provided polymer compositions which showed good processibility, high toughness and high impact strength as shown in the [examples], ie ethylene interpolymer compositions characterized by having broad molecular weight distribution (MWD) and improved compositional uniformity. The Appellant put particular emphasis on the fact that the claimed products showed, due to their broad MWD, the required good processability without, however, suffering from reduced toughness, a general disadvantage inherent to polymers having a broad MWD, and referred to [0012], the content of which remained unchallenged: "In general, the invention represents the ability to separate I_{10}/I_2, MWD and compositional uniformity into substantially independent properties and achieve a previously unknown combination of these intrinsic properties as well as a previously unknown combination of performance properties.".

The Appellant then addressed the individual features a) to e) of the compositions as defined in [Claims 1 and 2] and the influence different variables had on these features. Thus, it referred to the comonomer content, which affected the crystallinity and, hence, the density of the polymer (D9: bottom of page 263 and Table 8.11), and to the molecular weight (in terms of I_2) depending mainly on the chain length, controlled by the addition of hydrogen as a chain terminating agent. The MWD or polydispersity (in terms of M_w/M_n and the ratio of the melt flow indices I_{10}/I_2) would, according to the Appellant, be controlled by preparing the polymers at certain polymer splits in two or more

reactors run in different reaction conditions. The Appellant then explained the influence of changes of process parameters on the product properties with reference to the [tables] belonging to different series of [examples] and referred in particular to from [0058] to [0062] for the explanation of the CRYSTAF measurements and their meaning for feature e).

Moreover, the Appellant additionally pointed to the passages in the description, where, in its opinion, the reader could find sufficient disclosure concerning preferred catalyst systems for the claimed process ([0079] and [0080].

Additionally, the Appellant indicated that it would be prepared to delete [Claim 1], if the Board considered its process as being insufficiently disclosed.

(2) By contrast, the Respondent argued that there was lack of information throughout the patent about the process parameters necessary for reliably obtaining a product fulfilling features a) to e). It repeatedly emphasised that the reader would not know where to start from and in which direction to continue. In particular, the patent in suit would contain no repeatable example. This assessment would even be valid for [Example 2], which formed the basis for [Examples 12 and 17 to 19]. These examples were the only ones yielding products having the features a) to e) of [Claim 1]. They could not, however, be repeated due to lack of any information concerning the catalyst.

The decisive influence of the catalyst system used on the properties, in particular on the structure and the uniformity, of the resulting product was stressed by the Respondent, who referred in particular to [0093].

However, even in [Table 1], the catalyst was not specified, but was only described in terms of a "general definition of a catalyst" as "Heterogeneous Ziegler-Natta Titanium coordination catalyst system", and, despite the reference to other catalyst systems in [0079], the patent in suit did not contain a single example on the basis of any such further catalyst.

Furthermore, feature e) could only be seen as an unusual new and "strange" parameter, previously unknown in the patent or other technical literature. This would have required a detailed explanation of the process conditions necessary to achieve the required result.

Moreover, the Respondent disputed that the density (and the crystallinity) depended only on the comonomer content. Instead, it would, according to common general knowledge, also depend on the nature of the comonomer and of the catalyst used, which affected the formation of long chain branching. Further variables influencing the density would be the degree of orientation and the process conditions during the polymerisation and the subsequent cooling of the product.

The catalyst, furthermore, would have a significant influence on the MWD. Thus, whilst Z-N catalyst would normally cause an M_w/M_n in the range of from 3 to 5, a metallocene catalyst would, in general, produce polymers having an M_w/M_n of between 2 and 3.

However, instead of providing clear instructions about how to carry out the examples ("what the conditions are"), only general explanations were given, eg "Compositions 11-14 were manufactured using essentially the same polymerization system as described herein above for Inventive Composition 2." ([page 20,

lines 14/15]). A similar general explanation could be found on [page 24, lines 10/11], concerning the other examples mentioned above (ie [Examples 17 to 19]).

Moreover, the measurements of I_{10} and of I_{10}/I_2 reported in [Tables 4 and 5] for [Example 2] were inconsistent. Furthermore, the parameters in [Tables 4 and 9] given for the examples in accordance with [Claim 1] would show that different compositions had been made, however, without indicating how they had been produced.

Whilst it would be clear that the conditions must have been different, it would not be clear (in view of the wording of the claim), why [Example 1] had resulted in a product outside the claim, contrary to the product of [Example 2] which complied with [Claim 1]. One possible ground for the differences might have resided in the different site of the comonomer feed (cf. [Table 1]: reactor 2 in [Example 1], reactor 1 in [Example 2]). However, this feature was not discussed anywhere in the general description, and from comparative [Example 3], wherein the comonomer had been added to the first reactor as in [Example 2], it could only be concluded that the place of introduction of the comonomer had no relevance. The least that could be said was that the criticality of this process feature was hidden, contrary to the requirements for sufficient disclosure.

The reference to the particular good results achieved in [Example 19] and the comments thereon in [0117] did not, in the Respondent's view, remedy this deficiency, because this paragraph referred to many different process variables.

(3) The arguments previously presented in writing and/or at the hearing were further disputed between the parties, whereby each party maintained its view.

(4) Thus, with regard to the asserted inconsistencies of the I_{10}/I_2 measurements, the Appellant referred to the ASTM D-1238 (mentioned in [0067]) to show that the differences in the criticised values were within a range in accordance with the standard deviation accepted in the ASTM standard for such measurements, and argued that these values as given in the [tables] were in each case within the limits of the claim.

The question of whether feature e) was "unusual" was not, in the Appellant's view, a valid objection in opposition/appeal proceedings. In any case, the feature would draw a clear line between products within and those outside the claims. This would not, however, mean that a product outside the scope of the claims could not be prepared.

The Appellant put emphasis again on the fact that the patent in suit was, in the first place, directed to an ethylene polymer composition *per se* and only, in the second place, to a process for its manufacture. Moreover, it held that the Opponent/Respondent, who had had the burden of proof for its allegations, had not discharged this burden, in particular not the burden to show that the claimed product could not be prepared.

(5) By contrast and on the basis of the argument that there was no information available to identify the catalyst used, the Respondent maintained that the patent in suit did not contain any example which could be repeated and could, thus, serve as a starting point. Nor could the skilled person derive from the patent

which process conditions would influence the process in such a way that the resulting product would fulfil product feature e).

(6) When neither party wished to add any further comments on the Main Request, the debate was closed in this respect, and the hearing was interrupted for deliberation of the Board optionally on the final decision.

XI. The Appellant requested that the decision under appeal be set aside and the patent in suit be maintained as granted or, in the alternative, that the patent be maintained in amended form on the basis of one of Auxiliary Requests 1 to 3 as submitted with the Appellant's letter dated 22 April 2005, on the basis of Auxiliary Request 4 as submitted with its letter dated 11 March 2008 or on the basis of Auxiliary Request 5 as submitted with its letter dated 18 April 2008.

The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. In this case, the Board deems it helpful initially to recall the course of the opposition proceedings.

2.1 In its NOOP, the Opponent had raised grounds for opposition under Article 100(a) (lack of novelty and lack of inventive step) and Article 100(b) EPC 1973 (insufficiency of disclosure) and had, during the opposition proceedings, submitted two experimental reports "D5" and "D8" (section II(1), above).

2.2 However, since the decision under appeal dealt only with the insufficiency issue, the Board has exercised its discretion under Article 111(1) EPC and has limited its consideration to the asserted insufficiency of disclosure, as announced in the Communication annexed to the summons and also at the outset of the oral proceedings (cf. sections III, VII and X, above).

2.3 As pointed out in the Appellant's SGA (section V, above), the Opponent had not initially raised any doubts that it would be possible to prepare the claimed composition by means of a Z-N catalyst. Rather, it had only asserted that there had been lack of any guidance on how to obtain the composition aimed at by using a catalyst other than a Z-N catalyst system (section II(2), above).

2.4 Accordingly, the first of the two experimental reports (section 2.1, above), "D5", was to demonstrate that the process of [Claim 1] would not result in a product fulfilling features a) to e), when carried out with a metallocene single site catalyst (section II(2), above), whilst the second, "D8", was to show that the subject-matter claimed in the patent in suit was anticipated by Example 2 of D3 (section II(4), above).

2.4.1 In "D5", eight experiments were described wherein ethylene had been copolymerised with butene and/or hexene by means of one specific bis(n-butyldicyclo-pentadienyl) hafnium dichloride/methylalumoxane catalyst in a two-stage process, the first carried out in liquid phase and the second in gas phase.

2.4.2 The other experimental report "D8" was allegedly a repetition of Example 2 of D3, thereby including information from the FI patent specification 89500, to

which reference had been made in the general description of Examples 1 to 5 of document D3.

2.5 However, the Opponent has never refuted the results of the [examples], nor has it challenged the statement in [0012] of the patent itself. In [0012], it had been indicated that the variables of melt flow ratio, molecular weight distribution and compositional uniformity were able to be separated into substantially independent properties, as argued by the Appellant (section X(1), above).

2.6 The Opposition Division, however, indicated for the first time at the oral proceedings on 27 April 2005 that "both sufficiency of disclosure of metallocene catalysed processes and sufficiency of disclosure of Ziegler-Natta catalysed processes has to be discussed" and "raised the question whether the process of claim 1 (of the main request, of auxiliary requests 1,2 or 3) defined by product parameters can reliably be reproduced ..." (minutes, No. 4). The discussion, which followed at that hearing, mainly between the Opposition Division and the Patent Proprietor, then dealt, also for the first time, with the question of which [examples] complied with the requirements of [Claim 1], and in its decision, the Opposition Division then took the view that "The claimed parameters a) to e) are interdependent and modifications of the process features ... will not systematically lead to these parameters." (No. 2.3 of the reasons for the decision).

2.7 According to No. 6 of the minutes, the Opponent had disputed the Patent Proprietor's argumentation in the above discussion and stated that "the disclosure as a whole would be misleading and insufficient". Apart from

this general statement, it was only in the appeal proceedings, ie in the knowledge of the reasons given in the decision under appeal (sections III(3) to III(6), above), that the Respondent started to contest the sufficiency of disclosure of the patent in suit *as a whole* and to assert, that the patent did not contain a single example which could be repeated, and that this would even be valid for [Example 2], which would not identify the catalyst that had been used. Therefore, the reader would not know where to start from and in which direction to continue (section X(2), above).

2.7.1 In fact, in [Table 1] reference is made, besides the chemical compounds used in [Example 2], to the reaction conditions, residence times and degrees of conversion in the "two recirculating loop reactors configured in series" ([0091]), to a "Heterogeneous Ziegler-Natta Titanium coordination catalyst system". However, in [0080], the specification points out that a number of preferred Z-N catalyst can be prepared by methods known from a number of particular patent documents. The method of one of these documents is even further explained in [0083], including a reference to a particular example of that document. The detailed explanation in [0083] discloses the preparation of a $MgCl_2$-supported Z-N titanium catalyst with a Mg/Al/Ti ratio of 40.0:12.5:3.0, the slurry of which is then combined with the cocatalyst immediately prior to the introduction into the polymerisation reactor system to give an active catalyst with a final TEA:Ti molar ratio of 6.2:1. Whilst it is true, as mentioned above, that [Table 1] contains only a rather general definition of the catalyst system, the detailed description in [0083] provided the skilled person, in the Board's opinion, with a clear and complete disclosure concerning the

heterogeneous Z-N titanium catalyst system that could be used when repeating [Example 2].

2.7.2 Therefore, the Board cannot share the above view of the Opponent/Respondent, who had the burden of proof for its assertion, that the patent in suit did not provide a single example which could be repeated. Thus, this burden has not been discharged by the Respondent.

The Main Request

3. In general, the first claim in a patent application or granted patent relates to the claimed invention in its broadest scope. However, the sequence of claims in the patent in suit differs from that normal case, in that, here, it is not [Claim 1] which defines the "invention", as addressed in Article 100(b) EPC, but [Claim 2] (section I, above), which relates to the disclosed polymer composition *per se*, irrespective of the way in which it has been manufactured.

By contrast, [Claim 1] defines only one way of preparing this composition, as is evident from [0073] (and from the fact that it is limited by the product of [Claim 2]). Consequently, it is [Claim 2] which is the yardstick for sufficiency under Article 100(b) EPC. In other words, it is the composition of [Claim 2], which must be repeatable in its full scope, but not the process of [Claim 1], on which the decision under appeal had focused, thereby exceeding the objections raised by the Opponent at the opposition stage.

3.1 It follows therefrom, that the crucial point to be considered here concerns the question of whether the polymer composition of [Claim 2] in terms of (i) the chemical composition of the polymer "comprising

ethylene interpolymerized with at least one unsaturated comonomer" and (ii) the features a) to e), has been disclosed in a manner sufficiently clear and complete to be carried out by the person skilled in the art.

The latter features of the polymer composition are a) the melt flow ratio I_{10}/I_2, b) the M_w/M_n, c) the melt index I_2, d) the composition density and e) the weight percentage of that fraction of the composition in compliance with the definition of feature e).

3.2 No objections have been raised by the Respondent/ Opponent with regard to (i) the above chemical composition *per se* or (ii) with respect to any one of the above features a) to d) *per se*. Nor has the Board any reason to do so. The definitions of these features are well established in this art to define an ethylene (co)polymer. Moreover, further details of each of these features can be found on [pages 5 and 7] of the specification ([0050] and [0066] to [0070]).

3.3 The only objection raised by the Opponent/Respondent in the context of the definitions of the above features (ii) concerns feature e).

3.3.1 However, a long passage of the patent specification deals with the definition and the determination of this feature. In particular, the passage in from [0057] to [0062] must be mentioned, which includes *inter alia* a reference to a publication in the technical literature describing a technique using "crystallization analysis fractionation" ([page 6, lines 40 to 43]). According to this method referred to in the specification as the "CRYSTAF fractionalysis", a polymer solution was slowly cooled from 100 to 30°C at a fixed cooling rate (0.3°C/min), whereby the change of the residual

concentration of dissolved polymer over the time, or rather temperature, was determined, as shown in a number of diagrams, eg [Fig. 2], and as described in [0058].

In view of these details in the specification and the absence of any arguments to the contrary, the Board is satisfied that the CRYSTAF method can be repeated by the person skilled in the art.

3.3.2 According to the Appellant (section X(1), above), feature e) correlates this measurement with the density of the composition in terms of a mathematical equation set up by the Patent Proprietor in order to draw a line between compositions, which it considered to be in line with the intended scope of [Claim 2], and those, which were not (cf. [Figure 1] and [0063] to [0065]).

3.3.3 In the NOOP, one single objection had been raised with regard to feature e) of [Claim 2] and Article 100(b) EPC 1973, ie the objection that, "for density values of 0.935 g/cm^3 or higher the limiting weight percent at the dominant peak temperature above 75 °C, as determined using crystallisation analysis fractionation in the range of 20 to 100°C must be higher than 100 %, as calculated from the equation" (NOOP: page 5, first complete paragraph; section II(2), above). The correctness of these calculations was conceded by the Appellant/Patent Proprietor, who additionally referred to [Figure 1] for further explanation (cf. its letter of 16 January 2004, page 4, second complete paragraph; section II(3), above).

3.3.4 As shown by these statements, it was not in dispute between the parties, that it is impossible to exceed 100% of the weight percentage as defined in feature e).

Moreover, as pointed out by the Patent Proprietor, the diagram in [Figure 1] clearly supports this fact and, in the Board's view, in combination with [0063] additionally provides the clear teaching, that a composition (ie a high density polyethylene) which has a density to the right of the left graph (reaching the 100 weight-% line at between 0.934 and 0.935 g/cm^3) in [Figure 1] would never be in line with the definition of the product in [Claim 2].

3.3.5 Consequently the Board holds that the above objection to [Claim 2] concerns, if any, a question of clarity, but not the question of insufficiency of disclosure.

3.4 As already mentioned in section 2.3, above, the Opponent had not initially raised any doubts that it would be possible to prepare the claimed composition by means of a Z-N catalyst (sections II(2) and the statement as quoted in section V, both as above).

3.4.1 This formulation clearly demonstrates that the results in the [examples] were not contested by the Opponent, thus confirming the findings in sections 2.5 and 2.7.2, above.

3.4.2 Moreover, the later-filed experimental report "D8" (sections II(4) and 2.4.2, above), which according to the Respondent was a repetition of Example 2 of D3, even shows, in the Appellant's view, that the Opponent itself had, by adjustment of the process conditions in the knowledge of the patent in suit, been able to obtain a product within the definition of [Claim 2] (sections II(5), V(6) and VIII(2), above).

3.4.3 Indeed, "D8" does not describe a simple repetition of Example 2 of D3 as asserted by the Respondent, but it

includes choices and selections (the "adjustments" mentioned by the Appellant), one of which can eg be seen from the description of the respective catalyst systems used in D3. Therein, reference is repeatedly made to "the procatalyst of FI patent specification 89500" (section 2.4.2, above; page 20, lines 10/11, 15/16, 18, 31/32 and 35/36) without identifying its chemical composition. The description of "Examples 1 to 5" (page 11, lines 12 to 14), only identifies silica as being the support for the procatalysts used in these examples and adds the general information that "The active transition metal compound consisted of a reaction product of titanium tetraalcoxide [*sic*] and an aluminium alkyl chloride [*sic*] chlorinating this.". It identifies neither the specific titanium compound nor the specific chlorinating agent used in "Ref. 2" to provide the product corresponding to the data given in Table 1 of D3. Nor does this example refer to a specific example in the above FI-patent, contrary to "D8" (top of page 1). Therefore, the information provided does not, in the Board's view, clearly prove the identity of the catalyst systems as used, on the one hand, in Example 2 ("Ref. 2") of D3 and, on the other hand, in "D8". For this reason alone and irrespective of the further remarks of the Appellant concerning further adjustments of the reaction conditions in "D8" (sections V(6) and VIII(2), above; SGA, pages 12 to 14; chapter 3.2), the Appellant's arguments cannot be refuted, that, on the basis of the disclosure in the patent in suit and his common general knowledge, the person skilled in the art has been able to obtain a product within the ambit of [Claim 2], eg by modifying the method of another document, such as D3.

3.4.4 As already mentioned in sections II(2) and 2.4.1, above, the Respondent saw its arguments also confirmed by the experiments of "D5". According to the NOOP (page 4, paragraph 2), "an attempt to operate the process in the conditions disclosed in the examples for Ziegler-Natta catalyst but replacing the catalyst with a metallocene catalyst would inevitably lead to the formation of a polymer which does not meet the features required in Claim 1", because of the fact that "the metallocene catalysts are generally known to have different responses to hydrogen and comonomer than the Ziegler-Natta catalysts."

3.4.5 Contrary to the finding concerning report "D5" in the decision under appeal (section III(6), above), the Patent Proprietor had, however, argued (section II(3), above; No. 3 of its letter dated 16 January 2004), that D5 would only show that "it is possible to find reaction conditions under which products are obtained which do not have the claimed properties within the claims." This argument of the Patent Proprietor is, indeed, supported by the fact that contrary to the [examples] and contrary to its own statement quoted above, the reaction conditions in "D5" were significantly different from those in the [examples] (cf. [0091], [0107] and [0115]). Thus, the second stage was carried out in "D5" in gas phase, whilst the [examples] contain no reference to such a reaction stage and, in [Tables 1 and 2], reference is rather made to a "Solvent/C_2 feed ratio" for each of the reaction stages carried out in two loop reactors configured in series.

3.4.6 In view of these facts, arguments and findings, "D5" is not convincing evidence to show that the polymers of

[Claim 2] cannot be produced. The Respondent's above arguments to this end and the corresponding findings in the decision under appeal miss the point, in the Board's view, because as already stated in section 3, above, the yardstick for sufficiency of disclosure in this case is [Claim 2].

3.4.7 Moreover, as shown in a number of [examples] and even as demonstrated by the Opponent in "D8", the person skilled in the art could obtain different products within the scope of [Claim 2]. Although all [examples] were based on the use of a Z-N catalyst, it has never been argued, let alone shown that this one method would not make available all relevant polyethylene compositions of [Claim 2]. In view of the above successful results, the unsuccessful experiments of "D5" cannot demonstrate more than that they do not relate to a relevant polyethylene copolymer composition within the ambit of [Claim 2]. Hence, the Respondent has not discharged its burden of proof (section 2.7.2, above) to demonstrate that the polyethylene compositions within the ambit of [Claim 2] cannot be manufactured without undue burden on the basis of the teaching of the patent in suit.

3.5 In these circumstances and as regards the question to be decided here, the Board takes the view that [Claim 2] defines the subject-matter in its broadest scope, for which protection is sought, in a sufficiently clear and complete manner.

3.6 Consequently, the disclosure of the patent in suit is sufficient to enable the person skilled in the art to carry out the invention without undue burden.

4. As foreshadowed by the Board in its Communication annexed to the summons (section VII, above), the case is, therefore, remitted to the Opposition Division for further prosecution (Article 111(1) EPC).

5. In view of this conclusion there is no need for the Board to consider the auxiliary requests submitted by the Appellant. Furthermore, the Board wants to indicate that it has not dealt with the amended version of the description as submitted with the letter dated 25 March 2008 (section VIII(1), above).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance for further prosecution on the basis of the Main Request.

The Registrar: The Chairman:

M. Kiehl R. Young