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**D E C I S I O N**  
**of 12 September 2001**

**Case Number:** T 0482/99 - 3.3.3

**Application Number:** 89308848.4

**Publication Number:** 0359444

**IPC:** C08F 2/34

**Language of the proceedings:** EN

**Title of invention:**

Gas-phase alpha-olefin polymerization process in the presence  
of an activity retarder

**Patentee:**

BP Chemicals Limited

**Opponent:**

Elenac GmbH  
Union Carbide Corporation

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Novelty (yes) - prior disclosure - implicit features by  
reference (no)"  
"Inventive step (yes) - *ex post facto* analysis"

**Decisions cited:**

T 0153/85

**Catchword:**

-





Case Number: T 0482/99 - 3.3.3

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.3**  
**of 12 September 2001**

**Appellant:** Union Carbide Corporation  
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**Representative:** Hymers, Ronald Robson  
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**Other party:** Elenac GmbH  
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**Representative:** -

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 12 March 1999  
rejecting the oppositions filed against European  
patent No. 0 359 444 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** A. Däweritz  
J. De Preter



## Summary of Facts and Submissions

- I. The grant of European patent No. 0 359 444 in respect of European patent application No. 89 308 848.4 filed on 31 August 1989 and claiming priorities of 13 September 1988 and 27 April 1989, respectively, from two earlier applications in France (8812066 and 8905846) was announced on 10 November 1993 (Bulletin 93/45) on the basis of ten claims.

Claim 1 as granted read as follows:

"Process for continuous gas phase polymerisation of one or more alpha-olefins in a reactor containing a fluidised and/or mechanically stirred bed, with the aid of a catalyst and of an activity retarder, characterised in that the polymerisation is carried out by bringing a catalyst based on a transition metal belonging to groups IV, V or VI of the Periodic Classification of the elements into contact with the alpha-olefin(s) and a very small amount of the activity retarder which is introduced continuously into the reactor so that the molar ratio of the amount of activity retarder introduced to the amount of the alpha-olefin(s) introduced is from  $10^{-8}$  to  $10^{-5}$ , and at a flow rate which is varied with time so as to keep substantially constant either the rate of polymerisation or the content of transition metal in the polymer produced."

Claims 2 to 10 related to preferred embodiments of the process according to Claim 1.

- II. Notices of Opposition were filed on 3 August 1994 by BASF AG, whose opposition was transferred to Elenac

GmbH on 25 January 1999, (Opponent 1) and on 10 August 1994 by Union Carbide Corporation (Opponent 2). In both Notices of Opposition, revocation of the patent in its entirety was requested on the grounds of Articles 100(a) and 56 EPC and, as an auxiliary measure, oral proceedings. In a submission received on 22 December 1995, Opponent 2 filed additional observations regarding novelty.

The Oppositions were supported *inter alia* by the following documents:

D1: EP-A-0 186 174,

D2: EP-A-0 257 316,

D4: EP-A-0 174 863 and

D7: CA-A-1 266 857.

A further document,

D8: EP-A-0 019 330, which was referred to in D2,

was introduced by the Opposition Division. One further document cited after the opposition period was deemed not relevant and therefore not admitted under Article 114(2) EPC.

III. By decision announced orally on 25 February 1999 and issued in writing on 12 March 1999, the Opposition Division rejected the oppositions.

(i) In the decision, novelty was acknowledged over all cited documents. In particular, it was found that

the disclosure of D2, taken in conjunction with that of D8, did not directly and unambiguously disclose the subject-matter claimed in the patent in suit.

- (ii) For the assessment of inventive step, the Opposition Division took two different approaches starting from D2 and D7, respectively, as closest state of the art and came to the same conclusion for each of them that there was no incentive to combine any of the other documents with the closest state of the art so as to arrive at something within the scope of the claims in order to solve the relevant technical problem. The latter was seen in a definition of process conditions for a continuous gas phase polymerisation which allowed to increase the production without deterioration of product quality, e.g. due to the formation of hot spots and agglomerates of the polymer produced.

Only the first approach considered by the Opposition Division was referred to again in this appeal. It started from D2 which had the greatest number of features in common with the invention. According to the decision under appeal, the document was completely silent about specific amounts of **SCA** (selectivity control agent), the catalyst system, the respective feed rates of olefin, catalyst and the modifying agent and the molar feed ratio of the modifying agent to olefin.

None of the other citations indicated that an activity retarder should be added continuously in specific amounts which should be varied with time

in a continuous gas phase olefin polymerisation in order to control the polymerisation process. Consequently, the Opposition Division came to the conclusion that there was no incentive to combine any one of these documents with D2.

IV. On 30 April 1999, a Notice of Appeal was lodged by the Appellant (Opponent 2) against this decision with simultaneous payment of the prescribed fee. The Appellant requested that the decision be set aside and the patent be revoked in its entirety for lack of novelty and inventive step. As an auxiliary motion, it requested that oral proceedings be held. In the Statement of Grounds of Appeal which was received on 22 July 1999, the Appellant referred to the documents mentioned above. In particular, it relied upon D2 in conjunction with D8 to support its novelty objection. For this purpose, it argued that Example 1 of D8 disclosed a catalyst which provided the only missing feature in D2, i.e. the molar ratio of the amount of activity retarder to the amount of alpha-olefins of  $10^{-8}$  to  $10^{-5}$ . Then it referred to D1, D4 and D7 to demonstrate that the above range was generally used under continuous and batch conditions, so that no special adaptation techniques were necessary to transfer the catalyst used in the batch process in Example 1 of D8 to a continuous polymerisation process.

As regards inventive step, it argued that the technical problem underlying the claimed process, which had been the goal of all producers of polyolefins, was to be seen in the provision of a process in which the polymerisation rate (or catalyst activity or catalyst productivity or content of transition metal) could be kept at a substantially constant and high level and



yielding a high quality polymer product. This was achieved by capping high activity peaks through the measures recited in Claim 1. It was only a matter of routine experimentation to adjust the flows and molar ratios so as to achieve steady state polymerisation conditions, i.e. constant production rates and constant product quality. Therefore, the sole purpose of the measures in Claim 1 was to cap high activity peaks. The use of the relevant molar ratio of activity retarder to olefin was plainly obvious in view of D1 wherein the addition of e.g. 0.01 to 2 ppm of modifying agent, such as CO or O<sub>2</sub>, based on total olefin, was suggested.

- V. In its counterstatement of appeal filed on 10 March 2000, the Respondent supported the decision under appeal and disputed all aspects in the Statement of Grounds of Appeal as having already been dealt with in the opposition stage, and it requested that the appeal be dismissed, or, in an auxiliary request, oral proceedings be held.

In particular, it argued that D8 was chosen from nine documents referring to catalysts all of which were mentioned in D2. Moreover, the calculations based on an arbitrarily selected example of D8 represented an unallowable selection in relation to an allegation of lack of novelty.

- VI. In accordance with their respective auxiliary requests, the parties were summoned, in a communication issued on 9 May 2001, to oral proceedings to be held on 12 September 2001.

By letter received on 21 August 2001, the Appellant informed the Board that it would not attend the oral

proceedings and it withdrew its auxiliary request. On the same date, the Respondent suggested to cancel the oral proceedings if the Board would be able to reach a decision in its favour before the date set.

The party as of right (Opponent 1), which will be referred to as the "other party" in this decision, did not file any arguments or submissions in the written proceedings.

VII. Oral proceedings were held on 12 September 2001 in accordance with Rule 71(2) EPC in the absence of the Appellant, but in the presence of the Respondent and the "other party".

(i) The Respondent confirmed its submissions in writing and further emphasised that the disclosure of D8 could not to be read into D2 to prove lack of novelty for four reasons:

- (1) A selection had to be made from eight documents listed in D2. Therefore, it could not be directly and unambiguously derived that the catalyst of D8 was specifically incorporated into D2.
- (2) D2 described a gas phase polymerisation process. D8 referred to a process which could be carried out in liquid or gas phase, batchwise or continuously. Each type of process required specific adaptation of the particulars of the process features. This would also apply to the amounts of the constituents of the catalyst in the examples of D8, which related to a liquid phase

batchwise polymerisation. Moreover, there was no information available to the public which would prove the identity of the catalysts used in the examples of D2 and D8.

- (3) Whilst in D2 three components of a catalyst system were used separately (Figures 1 and 2: three separate feed lines for the solid Ti catalyst, the organo aluminium cocatalyst and the SCA; cf. column 14, lines 4 to 7 as well), the catalyst in D8 comprised only two components, the reaction product (a) of an organo aluminium compound and an electron donor and a solid component (b) (Claim 1; page 2, lines 10 to 13). This meant that the electron donor was no longer present as such. D8 did not suggest to supply SCA into the reactor as a separate feed.
- (4) Figure 4 of D2 taught a linear increasing correlation between the catalyst productivity **CP** and the xylene solubles **XS**, which indicated that CP was to be decreased in order to obtain the desired high isotacticity. The table in D8 (page 9) showed the opposite correlation (the higher the polymer yield, which corresponded to the CP, the lower the XS). From these data, it followed that the catalyst disclosed in D8 had a constitution different from that in D2. To support this argument, the Respondent submitted two drawings based on Fig. 4 of D2.

(ii) As regards inventive step, the Respondent saw the

problem to be overcome by the claimed process in a definition of a continuous gas phase polymerisation process which avoided hot spots and agglomeration of the polymer (patent in suit: column 1, lines 47 to 51; column 2, lines 3 to 7; column 3, lines 20 to 24; column 10, lines 23 to 25 and 47 to 49). In the prior art, deficiencies in this respect derived from unavoidable slight variations in the quality of the monomers and of the catalyst and fluctuations in the feed (column 3, lines 15 to 19). The catalyst was always prepared batchwise, regardless of whether it was to be used in continuous or batch polymerisation processes. Due to this fact, the transition metal content would vary in a continuous process even if the feed was constant over the total time of the continuous process, which actually was not the case. Due to the above variations and fluctuations as well as due to over-activity of the catalyst, peaks of the polymerisation rate occurred in a continuous polymerisation process. Since the limits of capacity to remove the reaction heat formed a "red line" never to be exceeded even at these peaks, a safety margin as regards maximum productivity had to be kept at the expense of productivity.

The solution offered by the claimed subject-matter included the flattening of the activity profile in terms of polymerisation rate by means of the continuous and varied feed of the activity retarder, and therefore allowed to minimise the necessary safety margin. In order to support this argument, five additional drawings were submitted

by the Respondent which showed diagrams of "Poly Rate" against "Time" and "Poly Rate" and "Retarder" against "Time", respectively. The "Retarder" curve was explained as giving the feed rate of the activity retarder, the "Poly Rate" meant the polymerisation rate.

Neither D2 nor D1 was concerned with the above problem but rather with the improvements of particular polymer properties (D2: isotacticity; D1: environmental stress cracking resistance **ESCR**, top of page 1).

D2 described a continuous gas phase polymerisation using a continuous feed of catalyst system and of SCA (electron donor). It was, however, silent about the amount of the SCA and did not contemplate to keep constant the polymerisation rate by varying the SCA feed.

D1 was not concerned with the polymerisation rate either, but aimed at an improvement of the **ESCR** by adding a modifying agent prior to or during the polymerisation reaction. Although the amount of carbon monoxide (one of the modifying agents) could fit into the claim under consideration, D1 did not describe a variation of the amount fed in with time.

As none of the documents referred to in the Statement of Grounds of Appeal dealt with the technical problem underlying the claimed subject-matter, there was no reason to combine D1 and D2 to solve the above technical problem.

(iii) The "other party" supported both the arguments and the request submitted in writing by the Appellant.

As regards novelty, it argued that the only example in D2 was based on the catalyst of D8. The catalyst of D8 could be used in liquid phase as well as in gas phase polymerisation. This was in accordance with general knowledge as supported by D1 (page 5, lines 14/15) and there was no need for specific adaptation. In any case, the molar ratio as defined in Claim 1 of the patent in suit spanned three orders of magnitude and thus did not constitute a real limitation.

According to the "other party", it was the aim in all polymerisation processes to produce polymers of high quality in high yields. This was true for the known processes as well as for the claimed subject-matter. As in the steady state conditions in the process of D2, the catalyst flow was kept constant and the SCA was varied to maintain the desired catalyst productivity, there was no difference between the known and the claimed processes and any modifications would be obvious to the skilled person in view of D2 and D1.

VIII. According to the file, the Appellant requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent requested that the appeal be dismissed, i.e. that the patent be maintained in its granted form.

## Reasons for the Decision

1. The appeal is admissible.
2. *Novelty*
  - 2.1 When assessing novelty, the disclosure of a particular prior document must always be considered in isolation; in other words it is only the actual content of a document (as understood by a skilled person) which destroys novelty. It is not permissible to "combine" separate items of prior art together, with the sole exception that, if a document (the "primary" document) refers explicitly to another document as providing more detailed information on certain features, part or all of the disclosure of the latter may be regarded as incorporated into the document containing the reference (T 153/85, OJ 1-2/1988, 1).
  - 2.2 In its Statement of Grounds of Appeal, the Appellant reiterated its objection of lack of novelty based on D2 in conjunction with Example 1 of D8. In the oral proceedings, the "other party" based its case on the same arguments.
  - 2.3 The first question to answer is therefore whether D8 can be considered to be a part of the disclosure of D2.
    - 2.3.1 The passage in D2 containing the reference to D8 reads as follows: "Supported coordination catalysts of this type are disclosed in numerous patents. See, for example, U.S. Patent Nos. 4,226,741; 4,329,253 and published European Patent Application No. 19,330." (D2: column 2, lines 15 to 18). This passage does not refer to a specific catalyst nor to any specific

polymerisation process, but only to generic types of supported catalyst systems.

2.3.2 The olefin polymerisation catalyst composition of D8 comprises (a) the reaction product of an organo aluminium compound and an electron donor and (b) a solid component which has been obtained by a specific method involving the halogenation reaction of an organo magnesium compound with a halide of tetravalent titanium in the presence of a halohydrocarbon solvent and the subsequent treatment of the solid, thus obtained, with a tetravalent titanium compound (Claim 1). The known catalyst can be used in olefin polymerisations which may be carried out by any one of the conventional techniques, such as gas phase or slurry polymerisation (page 6, lines 14 to 18).

2.3.3 It is well known in this art that the properties of an olefin polymerisation catalyst system are not simply the sum of the individual properties of its starting constituents, but depend strongly on the manner in which the catalyst was prepared.

D8 does not disclose nor suggest that any component, which would be equivalent to the activity retarder according to the patent in suit, should be present as such in or should be added separately during the polymerisation reaction. D8 clearly refers only to the addition of the **reaction product** derived from an organo aluminium compound and an electron donor, but not to the addition of its starting compounds, let alone to a continuous feed of electron donor, the amount of which is varied over the time.

This becomes even more evident in view of D2, wherein a



clear difference is made between an electron donor added during the preparation of the solid Ti catalyst component and an electron donor added separately to the polymerisation mixture as a SCA (column 2), which are often referred to in the art as "internal" and "external" electron donors, respectively.

2.3.4 It follows that, even if it were accepted that the whole disclosure of D8 was incorporated in D2, there is an inescapable incompatibility between the essential features of the catalysts according to D8, in which all the electron donor is incorporated by pre-reaction as part of the catalyst (Claim 1 and page 3, lines 20 to 22), and the essential features of the gas phase process according to D2, which provides, on the one hand, for an optional pre-reaction of electron donor to form part of the catalyst but requires, on the other hand, the separate addition of electron donor as an SCA. This fact, which was discussed with the parties in detail during the oral proceedings on 12 September 2001, was conceded by the "other party". Moreover, D2 is silent about the amount of SCA to be supplied. Therefore, it is not possible to draw any conclusions as to the molar ratio of activity retarder/olefin.

In this connection, the remark in the minutes of the first oral proceedings held before the Opposition Division on 25 January 1996 that "the amount of electron donor being present in ... D8 overlaps at least with the upper part of the range ... in claim 1 of the contested patent" is irrelevant, since it only relates to an amount of the pre-reacted electron donor.

In summary, it cannot be concluded that the molar ratio of activity retarder/olefin as defined in Claim 1 is

disclosed in D2 even when read in conjunction with the disclosure of D8.

- 2.3.5 The argument in the Statement of Grounds of Appeal, that prior art documents D1, D4 and D7 do not mention the need for special adaptation techniques as regards the manner in which the electron donor is supplied to the reactor, cannot serve to support the novelty case, for the following reasons.

D1 refers to a "specified concentration" of modifier which according to the examples appears to be kept constant, D4 describes a two stage polymerisation process for the manufacture of specific block copolymers with specified properties. In D7, the catalyst is initially inactivated for some time by bringing it into contact with an activity inhibitor; ethylene is only subsequently copolymerised with an  $\alpha$ -olefin without any addition of the inhibitor during the polymerisation (page 2, lines 1 to 9; page 8, lines 9 to 18 and 33 to 37).

Thus, it is evident that very different ways for carrying out an olefin polymerisation are disclosed in D1, D4 and D7. Consequently, the disclosures of the three documents mentioned above cannot serve to support the concept of a common general knowledge with respect to the way of supplying electron donor or catalyst poison to the reaction mixture, let alone, to the provision of such compounds for use in a gas phase polymerisation process.

In summary, the contention that there would be no need of adaptation techniques for the manner of addition of electron donor, to the extent that it has any clear

meaning at all in view of the incompatibility of the disclosures concerned (point 2.3.4, above) is not supported by the documents relied upon.

- 2.3.6 In the example of D2 a commercial catalyst SHAC-103 was used. D2 by itself does not provide any further details as to the composition of the catalyst. It has not been demonstrated that SHAC-103 would correspond to the disclosure of D8. Indeed, three of the further U.S. patents listed in D2 are assigned to the applicant of D8, who is the producer of SHAC-103, and they disclose olefin polymerisation catalysts and polymerisation processes using such catalysts as well.

Consequently, convincing evidence that the only catalyst composition in D2 which can be identified as SHAC-103 would correspond to a catalyst as disclosed in D8 has not been provided.

- 2.3.7 The objection of the Appellant and of the "other party" that the relevant molar ratio range of  $10^{-8}$  to  $10^{-5}$  did not constitute a real limitation is not convincing, since it was neither shown that the range was unconnected with the relevant technical effect, nor that such a range was inevitably fulfilled by the processes according to the state of the art. On the contrary, as shown above (points 2.3.3 and 2.3.4), D8 does not disclose the presence of such a component at all and D2 is silent about specific SCA/olefin or SCA/catalyst ratios during the polymerisation.

- 2.3.8 In summary, the disclosure of D8 cannot be incorporated into that of D2 in any meaningful way which would make available the relevant SCA/olefin molar ratio range, and the disclosure of D2 itself is deficient both as to

essential information concerning the identity of the catalyst used in the relevant examples and as to the amounts in which the SCA is applied.

2.4 Therefore, the Board finds, consistently with the decision under appeal, that the subject-matter of Claim 1 and therefore also of dependant Claims 2 to 10 of the patent in suit is novel.

3. *Closest state of the art: the technical problem*

3.1 The patent in suit is concerned with continuous gas phase polymerisation processes of  $\alpha$ -olefins.

Such a process is already known from D2 which, more specifically, discloses a process for controlled stereospecific polymerisation of  $\alpha$ -olefins with preselected isotacticity. The Appellant relied on this document in conjunction with D8 as closest state of the art in its submissions during these appeal proceedings. During the oral proceedings on 12 September 2001, the "other party" argued along the same lines. This argumentation corresponds to the said "first approach" in the decision under appeal.

3.2 In the patent in suit (column 1), technical problems are addressed which have a particular adverse effect in and are inherent to such continuous gas phase polymerisation processes, i.e. small variations in the course of the polymerisation resulting e.g. from slight fluctuations in the supply of the solid catalyst as well as in the quality of the catalyst or the  $\alpha$ -olefin. These small variations can cause an unexpected increase in the amount of heat evolved by the reaction which cannot be removed sufficiently rapidly and efficiently

by the gas stream passing through the fluid bed or other cooling means. This may give rise to the appearance of hot spots in the bed and the formation of agglomerates of molten polymer (patent in suit: column 1, lines 29 to 51; and the references in section VII(ii) above).

One way to restrict these adverse effects, namely to reduce the formation of agglomerates, has been to correct the reaction conditions sufficiently early, e.g. by lowering the polymerisation temperature or pressure, the feed rate of the catalyst. This inevitably caused a drop in the polymer production and a deterioration of the polymer produced during that period. Consequently, the general polymerisation conditions have been chosen with a safety margin such that hot spots and agglomerates cannot form, at the expense of a substantial loss of production or a deterioration of the polymer (patent in suit: column 1, line 51 to column 2, line 12; especially column 2, lines 1 to 9).

3.3 In the light of these shortcomings, which are not mentioned in D2, and in line with the introductory statements in the patent specification, referred to above, the technical problem underlying the patent in suit may thus be seen - in agreement with the decision under appeal (page 8, paragraph 5) - in the definition of a process for a continuous gas phase polymerisation under process conditions which allow to avoid such a loss in production, as referred to above, without the risk of a deterioration of product quality, i.e. hot spots and agglomerate formation).

3.4 According to the patent in suit, this problem is solved

by feeding continuously a very small amount of activity retarder into the reactor so that the molar ratio of the amount of activity retarder introduced to the amount of monomer introduced is kept within a range of from  $10^{-8}$  to  $10^{-5}$ , and the flow rate of the activity retarder is varied with time so as to keep substantially constant either the rate of polymerisation or the content of transition metal in the polymer produced.

In the examples of the patent in suit, linear low density polyethylene was prepared in a continuous gas phase polymerisation process from ethylene and butene-1 including the continuous addition of an activity retarder in such small but varying amounts during the polymerisation. The output of the polymer, which had a constant and satisfactory quality, remained constant without formation of agglomerates even after a number of days despite the random variations in catalyst activity and the inevitable fluctuations in the contents of impurities introduced by the monomers and other constituents of the gas reaction mixture.

Having regard to these results, the Board is satisfied that the above technical problem has been effectively solved by the claimed measures.

4. *Inventive step*

It remains to be decided whether this solution was obvious to a person skilled in the art having regard to the state of the art relied upon by the Appellant and the "other party".

4.1 D2 aims at a process for the controlled polymerisation

of stereospecific  $\alpha$ -olefins having a preselected isotacticity (column 4, lines 41 to 44). The selectivity to isotactic or stereoregular polymer is related to the amount of SCA which may reduce activity and catalyst productivity CP (D2: column 3, lines 43 to 49). Based on the knowledge of this correlation between CP and the isotacticity, the process of D2 is controlled by measuring the CP and adjusting the SCA/aluminium alkyl ratio accordingly (D2: column 14, lines 4 to 7; Figure 5).

- 4.2 It is evident from the above considerations that the technical problem underlying D2 has an emphasis entirely different from that addressed in the patent in suit. The document is silent with respect to any problems based on heat evolution and change of reaction temperature in the reactor causing hot spots and agglomeration of the polymer and to the question how to overcome these problems. In D2, reaction and reactor temperatures are controlled by means of known cooling means (column 6, lines 20 to 25) and are considered to be adjustable operating variables or conditions, based on which a specific isotacticity can be achieved by measuring and controlling catalyst productivity (column 7, lines 13 to 15, 33 to 37, 49/50; column 8, line 55). It is totally silent with respect to the unavoidable slight variations in the quality of the  $\alpha$ -olefins or catalyst or in the supply of catalyst to the reactor (cf. the patent in suit: column 3, lines 13 to 19). It is furthermore evident from this latter passage in the patent in suit that catalyst productivity and production rate are not related to each other in a constant proportion (based on a constant catalyst flow as suggested by the "other party" with a hint to D2: column 7, lines 3/4, and as disputed by the Respondent

with reference to the known problem to feed a solid in distinct amounts at constant speed).

- 4.2.1 Moreover, Figure 5 of the D2 clearly shows that the desired high selectivity in terms of isotacticity of the polymer can only be achieved at the expense of productivity by increasing the amount of SCA and thereby reducing the catalyst productivity. This would however result in the deficiencies discussed in column 2, lines 1 to 9 of the patent in suit (point 3.2, above).
- 4.2.2 The argument of the "other party" at the oral proceedings before the Board, that the general requirement of combining constant high production rate (productivity) with maximum achievable product quality meant that the measures taken according to D2 would, during periods of constant catalyst addition rate, in practice amount to the same as those defined in Claim 1 of the patent in suit, is not convincing, because it ignores the differences in the fundamental emphasis of the aims of the two processes, referred to above. In particular, the emphasis in D2 is on the achievement of high isotacticity, which will in general be achieved at the expense of productivity, also for the reasons given above (point 4.2.1). Consequently, far from tending to produce the same result (high productivity) the measures taken in the two processes will have a divergent tendency. This, taken with the absence, in D2, of any hint that the ratio of SCA addition to olefin used should be in the range corresponding to the solution of the above technical problem, is indicative that the argument is an essentially *ex post facto* one.
- 4.2.3 The further argument, that the relevant SCA/olefin



molar ratio range is so broad as to be meaningless and therefore inevitably fulfilled in the normal operation of the process according to D2 is also not convincing for the reasons given under "novelty" (point 2.3.7, above).

- 4.2.4 In summary, the disclosure of D2 gives no hint to the solution of the relevant technical problem.
- 4.3 D1 aims at a different problem as well. It describes a polymerisation process for producing polyolefins having an increased ESCR by exposure of the catalyst prior to or during the polymerisation reaction to a specified modifying agent, which may be identical to the activity retarder. The amount of modifying agent is expressed in terms of the amount necessary to increase the ESCR (page 4, lines 12 to 14) and not to reduce the activity of the catalyst by more than 25% (page 4, line 31 to page 5, line 8). All the other polymerisation parameters are kept as without the modifying agent, whether in bulk, gas phase or slurry (page 5, paragraph 2). The feed of the modifying agent is adjusted to the specified, apparently constant concentration necessary therefor (Tables I and II; page 8, 19 to 11). A variation of the amount has not been contemplated in the document. Thus, its disclosure has no relevance for the solution of the stated technical problem.
- 4.3.1 In particular, the level of addition of modifier in D1 has no relevance to the solution of the above technical problem but concerns the achievement of a certain polymer property, i.e. a high ESCR.
- 4.3.2 Thus, the argument that the skilled person operating according to D2 would choose the level of modifier

preferred in D1 is an *ex post facto* argument.

4.4 None of the other documents D4 and D7, mentioned in the Statement of Grounds of Appeal, aims at the relevant problem any more than D1 does (see point 2.3.5, above).

4.5 In summary, the Board concurs with the finding in the decision under appeal, that the process for continuous gas phase polymerisation of olefins as defined in Claim 1 is not obvious to a person skilled in the art in view of the prior documents relied upon by the Appellant. Therefore, the subject-matter of Claim 1 involves an inventive step (Article 56 EPC).

The same conclusion applies to the subject-matter of Claims 2 to 10, which relate to preferred embodiments of the process of Claim 1.

## **Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young