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D E C I S I O N
of 24 August 2005

Case Number: T 1122/02 - 3.3.3

Application Number: 92307670.7

Publication Number: 529977

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Language of the proceedings: EN

Title of invention:
Ethylene polymerisation process

Patentee:
Innovene Europe Limited

Opponent:
Eastman Chemical Company

Headword:

-

Relevant legal provisions:
EPC Art. 54

Keyword:
"Novelty - novelty of the selected range (no)"
"Definition of a new range - constituting merely a formal delimitation from the state of the art (arbitrary selection)"

Decisions cited:
T 0198/84, T 0265/84, T 0279/89, T 0275/96, T 0766/99

Catchword:

-



Case Number: T 1122/02 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 24 August 2005

Appellant: Eastman Chemical Company
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office dated
18 September 2002 and posted 2 October 2002
concerning maintenance of the European patent
No. 529977 in amended form.

Composition of the Board:

Chairman: R. Young
Members: A. Däweritz
C. Heath

Summary of Facts and Submissions

- I. The grant of European patent No. 0 529 977 in respect of European patent application No. 92 307 670.7, filed on 21 August 1992 and claiming priority of 30 August 1991 of an earlier application in France (9111021), was announced on 29 April 1998 (Bulletin 1998/18). The patent was granted with 10 claims.

Independent Claims 1 and 9 as granted read as follows:

- "1. An ethylene polymerisation process carried out with the aid of a Ziegler-Natta catalyst system comprising atoms of titanium, halogen and magnesium, said process characterised by carrying out the ethylene polymerisation in the presence of a halogenated hydrocarbon compound in a quantity such that the molar ratio of halogenated hydrocarbon compound to the titanium of the catalyst is in the range from 0.01 to 1.8.
9. A multistage ethylene polymerisation process characterised in that one stage of the polymerisation is performed according to the process according to any one of claims 1 to 8."

The remaining dependent Claims 2 to 8 and 10 related to elaborations of the process of Claim 1.

The above molar ratio will be referred to herein as "molar HHC/Ti ratio" (HHC denoting "halogenated hydrocarbon").

II. On 29 January 1999, a Notice of Opposition was filed in which revocation of the patent in its entirety was requested on the ground that none of the claims defined patentable subject-matter (Article 100(a) EPC) in the sense of Article 52(1), 54 and 56 EPC (lack of novelty and lack of inventive step). To this end, the Opponent initially relied on four documents D1 to D4, including

D1: US-A-3 354 139.

In the course of the opposition proceedings, four further documents were cited by the Opponent including

D5: US-A-4 657 998 and

D7: EP-A-0 230 707.

Except for D7, these additional documents as cited after the opposition period were, however, deemed not relevant and, therefore, not admitted by the Opposition Division into the proceedings under Article 114(2) EPC.

In a letter dated 22 January 2001, two sets of claims forming a new Main Request (Claims 1 to 9) and a first Auxiliary Request (Claims 1 to 8) were filed by the Patent Proprietor.

The independent claims of this Main Request read as follows:

"1. An ethylene polymerisation process carried out with the aid of a catalyst system of the Ziegler-Natta type comprising a titanium based catalyst and an organometallic compound of a metal of groups I to III

of the periodic classification of the elements as a cocatalyst, said process characterised by carrying out an ethylene gas phase polymerisation in the presence of hydrogen and of a halogenated hydrocarbon compound in a quantity such that the molar ratio of halogenated hydrocarbon compound to the titanium of the catalyst is in the range from 0.01 to 1.8, the titanium based catalyst comprising atoms of titanium, halogen and magnesium.

8. A multistage ethylene polymerisation process characterised in that one stage of the polymerisation is performed according to the process according to any one of claims 1 to 7."

In a letter dated 13 July 2000, additional objections had been raised under Articles 100(c), 100(b) and 84 EPC which, according to the findings of the Opposition Division, were not, however, maintained by the Opponent (interlocutory decision: item I.10).

III. In the interlocutory decision of the Opposition Division announced at the end of oral proceedings on 18 September 2002, the patent in suit was found able to be maintained on the basis of the above Main Request, because the claims and the description adapted thereto met the requirements of the EPC.

In particular, the subject-matter claimed was held novel over each of the five documents considered in the proceedings, ie D1 to D4 and D7. Thus, as regards D1 to D4, only D1 made reference to the presence of HHC compounds in its polymerisation process. In this process, which disclosed the use of a Ziegler catalyst,

but was silent with respect to hydrogen, the halogenated compound served as a regulator for the control of the molecular weight. Nor did D1 refer to the use of a Ti-based catalyst comprising magnesium.

As regards D7, the decision under appeal held, in particular, that, firstly, a selection of the halogen containing compound, which was to be added to the polymerisation mixture, had to be made from a group comprising halogenated hydrocarbons, halogens, inter-halogenous compounds and halides of aluminium, tin, lead, phosphorus, antimony and sulphur.

Secondly, the molar HHC/Ti ratio in the catalyst as defined in Claim 1 of the patent in suit (0.01 to 1.8) had not been disclosed in the document. Corresponding ratios calculated by the Opponent from the data in the examples of D7 ranged from 3.2 to 13.4. Moreover, a general range of this ratio, which had also been calculated by the Opponent on the basis of data given in the description for the amounts/concentrations of the halogen-containing compound and of titanium contained in the catalyst, extended from $4 \cdot 10^{-6}$ to $5 \cdot 10^5$.

Thirdly, although mention was made of the possibility to carry out that process in liquid or gas phase, the document was clearly directed to a liquid phase polymerisation, as shown in all its examples.

Consequently, the Opposition Division acknowledged novelty of the claimed process. Moreover, it did not qualify this process as being a "selection invention" vis-à-vis D7 as contended by the Opponent.

The technical problem vis-à-vis D7, considered as the closest state of the art, was seen by the Opposition Division in the provision of a process for the reduction of ethane formation without substantial variation of the average activity of the catalyst.

It was accepted in view of Examples 3 and 4 of the patent in suit that, with variation of the molar HHC/Ti ratio within the range claimed, the same catalyst activity had been achieved. Moreover, whilst the result obtained in liquid phase polymerisation was not deemed necessarily valid for the gas phase, no evidence had been provided by the Opponents to demonstrate their allegations about the influence of the concentration of halogenated compounds on catalyst activity in gas phase processes.

Consequently, since the Opponent had not shown that the claimed subject-matter was made obvious by the cited prior art, the Opposition Division also acknowledged inventive step.

IV. On 11 November 2002, a Notice of Appeal was filed by the Opponent/Appellant against this decision. The prescribed fee was paid on the same date. The Statement of Grounds of Appeal was received on 7 February 2003 together with

E3: an additional experimental report,

E2: with tables and figures containing the results thereof and

E1: tables and a figure depicting the results of examples of D7.

In the Statement of Grounds of Appeal and in a further letter dated 12 November 2003, the Appellant contested the reasons in the interlocutory decision and maintained its objections of lack of novelty and of inventive step on the basis of D7. In particular, it argued that "D7 makes available a range of molar ratios of halogenated hydrocarbons to titanium which spans that claimed (0.01 to 1.8)", that the respective values of this feature in the examples provided by D7 were remarkably close to the claimed range and that the technical problem underlying the patent in suit was "an artificial construct" and "the chosen range is an arbitrary one, so that no real technical problem has been solved. ... **if** any problem has been solved, it has only been solved for batch wise processes and not for continuous processes. Hence, the claims do not solve the technical problem across their full scope, and cannot therefore involve an inventive step." (Statement of Grounds of Appeal: page 4, lines 5/6 and page 2, last paragraph extending to page 3). In support of this argument, the Respondent referred to the additional experiments data in E2/E3. Consequently, the technical problem to be solved would have to be reformulated in the direction of a batch wise process (Statement of Grounds of Appeal: page 6, second half, "Problem not solved"). The solution of this problem was, in the Appellant's view, trivial and obvious with regard to D7. At least, the patent in suit had not shown that the problem would be solved within the whole range claimed (letter dated 12 November 2003: page 6, last line to the next page).

Moreover, the Appellant criticised that, contrary to the finding in the decision under appeal, the patent in suit related to a selection invention and that the requirements therefor as set out in T 198/84 (OJ EPO 1985,209) and T 279/89 of 3 July 1991 (not published in OJ EPO) were not satisfied by the claimed subject-matter (Statement of Grounds of Appeal: page 4, penultimate paragraph to page 5, first half).

- V. In a letter dated 20 August 2003, the Respondent contested the arguments of the Appellant and supported the decision under appeal. Furthermore, it requested also that D7 be disregarded, since it was even less relevant than the late filed D5, which had not been admitted into the proceedings by the Opposition Division.

In particular, the Respondent pointed out in its letter (i) the differences between polymerisations carried out in liquid and in gas phase, respectively, and (ii) that the patent in suit did not relate to a "selection invention", since the claimed range of the molar HHC/Ti ratio was not the only difference between the claimed process and D7. Thus, it quoted the findings in the decision under appeal (i) that D7 was clearly directed to a liquid phase polymerisation and that there was no other mentioning of the gas phase in the description besides one general statement, (ii) that D7 did not disclose the claimed molar HHC/Ti ratio of 0.01 to 1.8, that all its examples lay outside this range and that the claimed range was very small in comparison to the broadest possible range of D7 which had only been calculated, and (iii) that a selection had to be made

from the halogen-containing compounds in order to arrive at the claimed subject-matter (decision under appeal: page 6, item 2.4).

In the Respondent's view, D7 neither contemplated any relation between catalyst activity and the use of HHC, nor did it suggest to use HHC in a quantity within the claimed molar ratio in a gas phase polymerisation in order to reduce the ethane formation without substantially varying the average catalyst activity.

VI. With effect as from 15 July 2005, the patent in suit was transferred to a new Patent Proprietor for the designated Contracting States AT, BE, DE, ES, GB, IT, NL and SE.

VII. Oral proceedings were held on 24 August 2005 in the presence of both parties. The essentials of these proceedings and the additional relevant arguments of the parties can be summarised as follows:

(1) Since the Respondent accepted the discussion of D7 in the proceedings, the question of admissibility of this document did not arise any more.

(2) The Appellant pointed out that the additional experimental data in E2 and E3, as filed with the Statement of Grounds of Appeal, were in reply to the comments of the Opposition Division in the decision under appeal. Moreover, the results in these experiments showed that, not only in the experiments 5A to 5D of the report, which had been accepted by the Respondent as being valid comparison examples (cf. letter of 20 August 2003, page 8, last paragraph), but

also in the other experiments, a change in the molar HHC/Ti ratio had caused a change of the catalyst activity. This effect was manifest within a given experiment, wherein the measurements in steady state before and after changes of the molar HHC/Ti ratio were compared with each other.

(3) The Respondent did not formally object to E2 and E3 being considered in these proceedings and conceded that part of the experiments in E2 and E3 fell inside the scope of Claim 1 of the patent in suit. However, it argued that the examples in these documents were not sufficiently relevant for challenging the validity of the patent in suit, because they contained only "snapshots" from a wider range of continuous operations, as they were carried out in a particular piece of equipment and used a particular catalyst in different conditions, ie they differed in more than one feature from each other. Nor were they representative for continuous processing, as encompassed by the claims under consideration and as disclosed eg in Example 1 of the patent in suit. Nor was the Respondent convinced that the reaction parameters had been held constant in these examples. Examples 3 and 4 of the patent in suit, however, relating to batch processes, described embodiments differing from each other in only one feature and demonstrated that ethane formation was reduced with no or no substantial variation in catalyst activity when applying different molar HHC/Ti ratios within the specific range as defined in Claim 1, provided the other process variables were held constant (patent in suit: column 2, lines 7 to 13). Changes of eg the reaction temperatures and concentrations of the catalyst components or the addition of further

additives would, however, have an influence on and would change the average catalyst activity.

(4) The argument on the basis of Examples 3 and 4 of the patent in suit was disputed by the Appellant because 0.6 mmol of chloroform (trichloromethane), as used in Example 3, had been replaced in Example 4 by 1 mmol of trichloro-1,1,1,-ethane. Hence, these examples did not, in the Appellant's view, support the above contention of the Appellant that, on the basis of one halogenated hydrocarbon, a variation of the molar HHC/Ti ratio within the limits of Claim 1 did not change the catalyst activity. As demonstrated in the experiments of E2/E3, this contention was, in any case, contrary to the facts found in continuous ethylene gas phase polymerisations also encompassed by the claims.

(5) Also the observation of the Respondent was disputed by the Appellant, that, in E2/E3, only the productivity in terms of polymer yield per prepolymer as charged had been provided, rather than the catalyst activity. The Appellant referred to activity values in terms of "g PE/mmTi·h·0.1MPa" ("mmTi" was identified by the Appellant as referring to mmol Ti) given in addition to the above productivity.

(6) After deliberation, the Board informed the parties that Examples 4, 9, 10, 11 and 12 of E2/E3 would be admitted into the proceedings.

(7) The Appellant additionally pointed out that D7 was not limited to liquid phase, but also included gas phase polymerisation. Thus, apart from the direct mention of both methods on page 9, lines 20/21, the

basis for the amounts of the catalyst components in the description were defined not only in terms of "mmol per 1 litre of solvent", but also of "mmol per 1 litre of reactor". This latter definition would make sense only for the polymerisation in gas phase (D7: page 9, lines 1 to 7).

(8) With regard to the calculations of the Appellant to show that the molar HHC/Ti ratio had been remarkably close in the examples of D7 to the claimed range, the Respondent argued that the significance of this ratio for the claimed invention had not been realized in D7, that the calculations were based on hindsight and related to liquid phase polymerisation.

VIII. The Appellant requested that the decision under appeal be set aside and that the patent in suit be revoked in its entirety, whereas the Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of documents*

2.1 In addition to documents D1 to D4 mentioned in the Notice of Opposition, the Opponent cited three further documents after the nine month opposition period (Article 99(1) and Rule 55(c) EPC), namely with its letters dated 13 July 2000 and 16 July 2002. Moreover, in the oral proceedings before the Opposition Division, yet another document was referred to by the Opponent,

which had a relevant filing date more than two years after the filing date of the patent in suit and more than three years after the claimed priority date and, therefore, did not comply with the definition of "state of the art" in Article 54(2) EPC.

According to the minutes of those oral proceedings (item 5) and the decision under appeal (item I.10), the Opposition Division, after consideration of the relevance of the prior art documents, did not admit them into the proceedings under Article 114(2) EPC, with the sole exception of D7, which was considered as representing the closest state of the art.

The Board has no reason to take a different position with respect to the admissibility of these late-filed documents. Moreover, the Respondent gave its consent to take D7 into account, and the Appellant argued that D7 was more relevant than other available prior art.

2.2 With regard to the further experimental data in documents E2 and E3 as filed with the Statement of Grounds of Appeal (section VII, above, paragraphs 2 to 5), the Board has come to the following conclusions:

2.2.1 These data are a direct reply to the reasons (Nos. 3.4 and 3.5) in the decision under appeal, that the Opponents had not provided evidence to support their allegations and, consequently, had not shown that the claimed invention was made obvious by the cited prior art, and the data were filed at the earliest possible occasion (the Statement of Grounds of Appeal). Hence, they neither delay the proceedings, nor constitute an abuse of procedure.

2.2.2 The experimental report contains Examples 1 to 13, all relating to gas phase polymerisations of ethylene, carried out in different marginal conditions. They contain some examples which *prima facie* show, that the catalyst activity, measured in the steady state, in the course of the polymerisation in a given example, before and after changes of the molar HHC/Ti ratio within the limits of Claim 1, was affected by these changes. This was found valid for Examples 4, 9, 10, 11 and 12 of E3 as displayed in the tables of E2.

2.2.3 Therefore, the Board decided that the above examples of E2/E3 were relevant to the case and informed the parties during the oral proceedings, that they were admitted into the proceedings (section VII, above, paragraph 6).

3. *Article 123(2) and (3) EPC*

No objections have been raised in these appeal proceedings against the claims on file in respect of these requirements. Nor has the Board any reason to do so.

4. *Problem and solution*

4.1 The patent in suit concerns a process wherein ethylene is polymerised in the presence of hydrogen and of a halogen-containing compound with the aid of a Ziegler-Natta type catalyst comprising (i) a catalyst component containing Ti, Mg and halogen atoms and (ii) an organo-metallic compound of groups I to III of the periodic table as the cocatalyst (Claim 1). The process aims at

the substantial reduction of the formation of ethane during the polymerisation (column 1, lines 26 to 31).

- 4.2 Such a process is also known from D7, which refers to the same problem of increased formation of paraffins such as ethane, propane etc. by hydrogenation of the monomer in olefin polymerisation in the presence of large quantities of hydrogen, necessary for controlling the molecular weight of the resulting polyolefin, by means of a high activity catalyst (D7: page 3, lines 22 to 33). The catalyst component (A) of D7 undisputedly also comprises Mg, Ti and halogen, and it is used together with (B) an organometallic cocatalyst of metals of groups Ia, IIa, IIb, IIIb or IVb of the periodic table and (C) a halogen compound selected from HHC compounds, halogens, interhalogenous compounds and halides of Al, Sn, Pb, P, Sb and S, preferably HHC (Claims 1, 8 and 9; page 8, lines 53 to 56).

The amount of component (A) used is preferably equivalent to 0.001 to 2.5 mmol Ti or higher. Components (B) and (C) are used in amounts of 0.02 to 50 mmol and 10^{-5} to 500 mmol, respectively. The basis for each of these amounts is given in terms of "mmol per 1 l of solvent or per 1 l of reactor" (page 9, lines 1 to 5).

On the basis of these data, the Opponent had calculated a general range of the molar ratio halogen-containing compound to titanium in the catalyst used to range from $4 \cdot 10^{-6}$ to $5 \cdot 10^5$.

The polymerisation is carried out in liquid phase or in gas phase (D7: page 9, lines 20/21), which, according

to the Appellant, is confirmed by the reference to "per 1 l of the reactor", thus, clearly referring to gas phase polymerisation as opposed to "per 1 l of solvent" concerning the liquid phase polymerisation (section VII, above, paragraph 7).

Whilst the claims are silent in this respect, all the examples in D7 refer to liquid phase polymerisations. Most of them describe the polymerisation of ethylene in the presence of an HHC compound. The reduction of ethane formation in these examples is significantly better than in the respective comparative examples and those using other halogen-containing compounds (see D7: Tables 1 to 4). According to E1, the molar HHC/Ti ratios in the examples of D7 ranged, as calculated by the Appellant and not disputed by the Respondent, from 3.2 to 13.4, and the activities of the catalysts in the examples of D7 ranged from 400 to 1600 g polyethylene/mmole Ti·h·0.1 MPa (see eg Examples 9 and 11).

- 4.3 The decision under appeal (Nos. 2.4 and 2.5 of the reasons) held that the subject-matter of the patent in suit did not constitute a "selection invention", because, besides the general statement in the description, no mention was made in D7 of a gas phase polymerisation and the document was clearly directed to a liquid phase polymerisation. Moreover, D7 did not disclose the molar HHC/Ti range of from 0.01 to 1.8, and a selection of the halogenated compounds had to be made from different groups of compounds, which meant that the selected range of molar HHC/Ti ratios was not the only difference between the two processes.

Furthermore, in the decision under appeal, the technical problem to be solved vis-à-vis D7 was seen, on the basis of column 2, lines 7 to 13, of the patent in suit, in the reduction of ethane formation without substantial variation of the average activity of the catalyst (section III, above). In its letter of 20 August 2003 (page 6, item 3.1), the Respondent agreed to this formulation of the technical problem.

- 4.3.1 In view of the arguments of the Appellant that the subject-matter of the claims under consideration constitutes a selection from the process of D7 in the sense of T 198/84 and T 279/89, above; section IV, last paragraph), the Board has come to a conclusion different from the decision under appeal, for the following reasons:

Both D7 and the patent in suit relate, in the first place, to an olefin polymerisation process, wherein the hydrogenation of olefin monomer to the corresponding saturated hydrocarbon, in particular of ethylene to ethane, is to be reduced (D7: page 4, lines 19 to 21 in conjunction with page 3, lines 29 to 33; the patent in suit: column 1, lines 10 to 15, 26 to 31 and 38 to 51).

As conceded by the Respondent, the catalyst system as defined in Claim 1 fulfils all the requirements of the definition of the catalytic system in Claim 1 of D7. Thus, both catalytic systems in D7 and the patent in suit undisputedly comprise atoms of titanium, magnesium and halogen, so that, in this respect, the claimed subject-matter is not distinct from the process of D7.

In the description of D7, mention is also made of the polymerisation of olefin in either liquid or gas phase, as does the patent in suit in its granted version (column 8, lines 43/44; as regards D7, see section VII, above, paragraph 7; and section 4.2, above).

Moreover and as already pointed out in section 4.2, above, HHC compounds are the preferred choice of the halogen-containing compounds in D7. In this respect, even the decision under appeal referred to a selection, however, without referring to this preference of HHC compounds in D7 (No. 2.4 of the reasons, item (3)).

Since D7 is, however, silent about a range of the molar HHC/Ti ratio, the Appellant had calculated specific values of the molar HHC/Ti ratio for those examples of D7, which comprised the use of a HHC, and, on the basis of the ranges of concentrations/amounts of its components (A), (B) and (C) (D7: page 9, lines 1 to 13), a general range for this feature extending over about eleven magnitudes including the range in Claim 1 of the patent in suit (cf. the above sections IV, VII (paragraph 8) and 4.2).

Hence, in the Board's view, the claimed subject-matter relates to particular elaborations of the process of D7. This finding gives rise to the question of whether the selection made has been purposive rather than arbitrary.

4.3.2 The Appellant further disputed that the decision under appeal referred to the relevant technical problem to be solved by the claimed process with regard to D7 (cf. sections IV and 4.3, above). In support of this view, it argued that the patent in suit contained only

examples to batch polymerisations, so that the patent in suit did not demonstrate that both of those aspects of the problem as defined in the decision under appeal, ie the reduction of ethane formation without substantial variation of the average catalyst activity, were solved within the whole range of the claims. Rather, the experiments in E2/E3 would show that, in continuous gas phase polymerisations of ethylene, the variation of the molar HHC/Ti ratio also affected the average catalyst activity, contrary to the Respondent's assertions in this respect (patent in suit: column 2, lines 11 to 13: "Surprisingly within these ranges no substantial variation of the average activity of the catalyst is observed"). Hence, the selection was, in the Appellant's view, arbitrary, because the selected range had only the same capabilities and properties as the whole range (section IV, above, Statement of Grounds of Appeal, page 5, first complete paragraph).

- 4.3.3 Although the Appellant's argument that the patent in suit did not provide data concerning the continuous polymerisation of ethylene is not valid in view of its Example 1 describing such a process, the Board nevertheless takes the view that the patent in suit does not contain sufficient information which would convincingly confirm the assertion in the specification, quoted above, and would invalidate the results in E2/E3.

Thus, Example 1 of the patent in suit does not provide any information as to the activity of the catalyst, let alone the influence of the molar HHC/Ti ratio thereon.

Nor can Examples 2 to 4 convincingly provide such information. These latter examples relate to

discontinuous polymerisations of ethylene, carried out in the absence of a HHC (Example 2), in the presence of 0.6 mmol of CHCl_3 (Example 3) and in the presence of 1 mmol of $\text{CH}_3\text{-CCl}_3$ (Example 4), respectively. Hence, Examples 3 and 4 do not fulfil the requirements for convincing evidence with regard to the above assertion concerning a constant catalyst activity either, because they differ in both the nature of the HHC used and the amounts thereof. Despite the fact that they were carried out in liquid phase, this finding is also supported by the results of Examples 1 and 3 to 7 of D7, which show that the different compounds affect the ethane formation to a different degree. Namely, in Examples 1 and 6, wherein not only identical amounts of the respective HHC compounds were used, but wherein also the molar HHC/Ti ratios were the same, different degrees of reduction of the ethane formation were found: the use of 1,2-dichloroethane in Example 1 gave 0.005% ethane formation (page 12, lines 8/9), that of 1,1-dichloroethane in Example 6, however, 0.013% (page 13, Table 1).

Consequently, the examples in the patent in suit do not allow any meaningful conclusion to be drawn with regard to the influence of different molar HHC/Ti ratios. They only show that, by adding such compounds, the ethane formation can, in principle, be reduced, as suggested by D7.

In fact, nowhere in the patent in suit has an assertion been made that specific molar HHC/Ti ratios would result in an improvement in respect the degree of reduction of the ethane formation. Rather, the patent in suit refers to the importance of the specific range

of molar HHC/Ti ratios only in the context of the alleged absence of any variation of the average catalyst activity (column 2, lines 11 to 13).

- 4.3.4 The Appellant has disputed, however, on the basis of its additional experiments filed in E2/E3, that the claimed effect of constant catalyst activity would be achieved over the whole range of the claims.

The data in E2/E3 as admitted into these proceedings (sections 2.2.2 and 2.2.3, above) demonstrate, indeed, that, in a given example, the further addition or reduction of the molar HHC/Ti ratio, within the limits of the range defined in Claim 1, in the course of a continuous gas phase polymerisation of ethylene resulted in a variation of the average catalyst activity, as demonstrated by measurements in steady state before and after the changes of the HHC feed (E3: page 1, first paragraph).

Thus, in Example 4, the decrease of the molar CHCl_3/Ti ratio in one step from 1.5 to 0.5 resulted in a reduction of the average catalyst activity from 205 to 165 g PE/mmol Ti·h·0.1 MPa, when the steady state was again reached after approximately 6 h of transition (E3: page 8, lines 2 to 16).

In Example 9, an increase of the molar CHCl_3/Ti ratio in one step from 0.04 to 0.1 (ie in the region of low contents) resulted in a slight increase of the catalyst activity from 90 to 92 g PE/mmol Ti·h·0.1 MPa after 8.5 h of transition (page 18, lines 6 to 13).

In Example 10, the molar CHCl_3/Ti ratio was increased in one step from 0.1 to 0.2, resulting in an increase of the catalyst activity from 92 to 111 g PE/mmole Ti·h·0.1 MPa after the transition which took approximately 4.5 h (page 19, lines 3 to 10).

In Example 12, the molar CHCl_3/Ti ratio was increased in three equal steps from 0.3 to 0.6. The initial catalyst activity prior to any change of the molar CHCl_3/Ti ratio was 143 g PE/mmole Ti·h·0.1 MPa, the final activity at a molar CHCl_3/Ti ratio of 0.6 was found to be 180 g PE/mmole Ti·h·0.1 MPa (page 20, last three lines, page 21, last three lines and page 22, lines 1/2). In addition to these data, the initial prepolymer productivity and the prepolymer productivity (in terms of kg of polyethylene per kg of prepolymer) for all subsequent steps is provided.

Whilst conceding that the catalytic system in the experimental report complied with the definition in Claim 1 of the patent in suit, the Respondent argued that it would not be apparent in E2/E3 that the other reaction conditions had been maintained constant, that, during the transition, further variations of the activity had occurred, and that the selection of a HHC from the various types of compounds in D7 had been made by hindsight. Therefore, no reliable and meaningful conclusions from these experiments could be drawn. However, the Board cannot concur with these arguments, because, in each of these examples, explicit reference is made to the process conditions in a table contained in the report and no inconsistencies have been found between the values in the table referred to and those values relating to process conditions specified in the

description of each example, and the use of HHC was preferred in D7 (sections 4.2 and 4.3.1, above).

Moreover, the values of the molar HHC/Ti ratios of 0.04, 0.1, 0.2, 0.3, 0.5, 0.6 and 1.5 in these experiments are, in the Board's view, representative of the claimed range of from 0.01 to 1.8, and variations of activity during a transition, ie in unstable conditions, cannot invalidate comparisons of the measurements carried out in steady state before and after the transition. Therefore, the Board cannot accept the argument that the examples in E2/E3 would only relate to a "snapshot" which is not representative for a continuous polymerisation process according to the claims of the patent in suit.

In any case, the reported results in the admitted experiments of E2/E3 *per se* have not been disputed by the Respondent. Neither within the time limit of four months set in the communication of 20 February 2003 with which the Statement of Grounds of Appeal and E1 to E3 had been communicated, nor in the meantime, has the Respondent filed any counter-experiments to refute these experimental data.

- 4.3.5 Consequently, the Board has come to the conclusion that these experiments of the Appellant, in contrast to the statement in column 2, lines 11 to 13 of the patent in suit, convincingly show that the catalyst activity is affected by the molar HHC/Ti ratio in the reaction mixture of a process for the gas phase polymerisation of ethylene within the definitions in Claim 1.

4.4 In view of these facts and findings, the Board is not satisfied that the technical problem as formulated in the decision under appeal (sections III and 4.3, above) is indeed solved by the process claimed throughout the full range of Claim 1.

Consequently, the technical problem to be solved with regard to D7 has to be formulated in a less ambitious way, because the assertion that no substantial variation of the average catalyst activity would occur has been disproved. Consequently, the relevant problem can only be directed to an alternative gas phase polymerisation process for ethylene in which the ethane formation (by hydrogenation of ethylene) is reduced.

5. *Novelty*

5.1 The decision under appeal in detail dealt with each of D1 to D4 and D7 and came to the conclusion that none of these documents anticipated the subject-matter of the Main Request. As regards D1 to D4, these findings have not been challenged by the Appellant. Nor has the Board any reason to take a different view in this respect.

5.2 As pointed out above (section 4.3.1, above), the claimed process relates to a selection from the disclosure of D7, contrary to the finding in the decision under appeal.

5.3 According to established jurisdiction, certain requirements have to be met so that novelty of a selection can be acknowledged.

5.3.1 Thus, according to each of T 198/84, T 279/89 (both above) and T 265/84 of 17 December 1986 (not published in OJ EPO), such an acknowledgement is only possible when **each** of the following criteria is fulfilled:

"(i) the selected sub-range should be narrow;

(ii) the selected sub-range should be sufficiently far removed from the known range illustrated by means of examples; and

(iii) the selected area should not provide an arbitrary specimen from the prior art, i.e. not a mere embodiment of the prior description, but another invention (purposive selection)." (see eg in No. 4.1 of the reasons in T 279/89, above, or in T 275/96 of 10 December 1998, not published in OJ EPO, No 4.2.2 of the reasons).

5.3.2 In T 265/84 (above), Number 5 of the reasons reads as follows: "When the question of novelty is considered, it is relevant that most of the claimed brazed varieties fall within the broadest scope of the disclosure in citation (1). The latter document describes all the essential features of the claimed invention in general, without disclosing any example, however, which would be embraced by the claim. Neither does (1) mention the range of limitations in the claim, not considering, of course, those for the optional ingredients in this respect, since these cannot change the novelty situation based on the essential components. In addition, phosphorus is excluded from the subject-matter claimed, whilst the cited art includes its use as a metalloid within a range of alternatives. Such

distinctions would not necessarily impart novelty to the selected ranges in the absence of any technical distinction in properties (cf. "Thiochloroformate/BASF" T 198/84, OJ 7/1986, 209, in particular paragraph 7, page 214 on "purposive selection"). This condition for novelty in an essential sense, contrasted to mere formal delimitations, is satisfied in the present case since the brazed articles manifest different, e.g. improved, properties from those in (1). ...".

5.3.3 In Decision T 198/84 (above), No. 7 of the reasons, the Board stated: "... It would be delimited only in respect of the wording of the definition of the invention, but not in respect of its content, if the selection were arbitrary, i.e. if the selected range only had the same properties and capabilities as the whole range, so that what had been selected was only an arbitrary specimen from the prior art. ...".

5.3.4 And in the case of T 766/99 of 26 February 2002 (not published in OJ EPO; No.5.2 of the reasons), a new effect hitherto unknown was neither mentioned in the patent application in suit nor asserted by the appellant/applicant, nor found to be connected to the partial range selected from the broad range of the state of the art, so that a purposive selection could not be acknowledged.

5.4 As shown in sections 4.1 and 4.3.1 to 4.3.5, above, the only feature of Claim 1 which in the present case could serve as a distinction from D7, ie the specific range of the molar HHC/Ti ratio, does not support the assertion of the patent in suit that a variation of the average catalyst activity would be avoided (cf.

sections 4.3.4 and 4.4, above). Nor is the reduction of the ethane formation connected to this range, and a purposive selection cannot be acknowledged in this respect, either (see, in particular, section 4.3.3, above).

Rather, the definition of the particular molar HHC/Ti ratio of Claim 1 has to be considered an arbitrary selection which cannot impart novelty to the claimed subject-matter, because of the absence of any technical distinction in the relevant features of and the relevant effects achieved by the processes of D7 and the patent in suit. Therefore, one of the essential conditions for novelty by selection, requiring that a distinguishing feature can be identified, which is clearly related to an additional effect and does not, thus, constitute merely a formal delimitation from the state of the art, is not satisfied in the present case (cf. section 5.3.2, above).

In other words, the range of the molar HHC/Ti ratio as defined in Claim 1 cannot be construed to constitute a purposive selection by which the claimed subject-matter could be distinguished from that of D7, because, by this feature, the claimed subject-matter would be delimited from D7 only in respect of the wording of the definition of the invention, but not in respect of its content (cf. section 5.3.3, above).

5.5 Consequently, criterion (iii) (section 5.3.1, above) required to be fulfilled for the acknowledgement of novelty, is not met.

Since each of the three criteria addressed in that section has to be complied with concomitantly for the acknowledgement of a purposive selection and, on this basis, also for the acknowledgement of novelty, there is no need to further consider the other two criteria (i) broadness of the selection and (ii) remoteness from the examples in the prior art.

- 5.6 For the reasons given above, novelty of the subject-matter of Claim 1 cannot be acknowledged.
6. Under these circumstances, the consideration of the other issue raised by the Appellant, that of inventive step, is not necessary either, because it cannot result in a different outcome of the decision.
7. Since the above set of claims represents the sole request of the Respondent on file, it follows that the patent in suit cannot be maintained.

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:

E. Görgmaier

R. Young