

Internal distribution code:

- (A) [] Publication in OJ
(B) [] To Chairmen and Members
(C) [X] To Chairmen
(D) [] No distribution

D E C I S I O N
of 29 June 2005

Case Number: T 0201/04 - 3.3.3

Application Number: 84902562.2

Publication Number: 0146620

IPC: C08F 20/04

Language of the proceedings: EN

Title of invention:

Interpolymers of ethylene and unsaturated carboxylic acids

Patentee:

THE DOW CHEMICAL COMPANY

Opponent:

Bayer AG, Leverkusen Konzernverwaltung RP Patente Konzern
E.I. Du Pont de Nemours & Company, Inc.

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 108
EPC R. 60(1), 65(1)
RPBA Art. 10(a)(2), 10(b)(1)

Keyword:

"Admissibility of the appeal by opponent 01 (no)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:

T 0194/88, T 0329/88, T 0793/93, T 0793/93, T 0989/93

Catchword:

-



Case Number: T 0201/04 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 29 June 2005

Appellant:
(Opponent II)

E.I. Du Pont de Nemours & Company, Inc.
1007 Market Street
Wilmington, Delaware 19898 (US)

Representative:

Abitz, Walter, Dr.-Ing.
Patentanwälte Abitz & Partner
Postfach 86 01 09
D-81628 München (DE)

Respondent:
(Proprietor of the patent)

THE DOW CHEMICAL COMPANY
2030 Dow Center
Midland, Michigan 48674 (US)

Representative:

Huber, Bernhard, Dipl.-Chem.
Weickmann & Weickmann
Patentanwälte
Postfach 86 08 20
D-81635 München (DE)

Other Party:
(Opponent I)

Bayer AG, Leverkusen
Konzernverwaltung RP
Patente Konzern
Bayerwerk
D-51368 Leverkusen (DE)

Representative:

Weber, Thomas, Dr. Dipl.-Chem.
Patentanwälte
von Kreisler-Selting-Werner,
Postfach 10 22 41
D-50462 Köln (DE)

Decision under appeal:

Interlocutory decision of the Opposition
Division of the European Patent Office dated
15 October 2003 and posted 1 December 2003
concerning maintenance of European Patent
No. 0597478 in amended form.

Composition of the Board:

Chairman: R. J. Young
Members: C. G. Idez
H. Preglau

Summary of Facts and Submissions

- I. Mention of the grant of European patent No. 0 146 620 in respect of European patent application No. 84 902 562.2, filed on 12 June 1984 as the International Patent Application No. PCT/US84/00914, claiming priority from an earlier application in the United States of America (504032 of 13 June 1983), was published on 30 December 1992 on the basis of 12 claims.

Claim 1 read as follows:

"A process for producing homogeneous, random inter-polymers of ethylene and at least one olefinically unsaturated comonomer selected from the group comprising acrylates, methacrylates, vinyl esters and olefinically unsaturated carboxylic acids, said process comprising inter-polymerizing the monomers in a substantially constant environment, under steady state conditions, in a single-phase reaction mixture, under the influence of a free-radical initiator, and in a well-stirred autoclave reactor operated in a continuous manner as the monomers are fed into the reactor and the reaction mixture is withdrawn, said process being characterized by the use of synthesis conditions of temperature and pressure which are elevated to a level high enough above the phase boundary between two-phase and single-phase operation such that the molecular weight distribution (MWD) boundary is reached, or surpassed, the said molecular weight distribution boundary being the highest ratio of weight average molecular weight/number average molecular weight obtainable in single-phase operation, said elevated pressure being greater than 14 M Pa (2000 psi) above,

and said elevated temperature being greater than 15°C above the synthesis conditions required at the phase boundary for a given mixture of ethylene and comonomer, thereby producing an interpolymer having less gels and/or grain."

Claims 2 to 8 referred to preferred embodiments of the process according to Claim 1.

Independent Claim 9 was directed to a random, homogeneous, single-phase interpolymer product fulfilling a number of specific conditions.

Claims 10 to 12 referred to elaborations of the interpolymer according to Claim 9.

II. On 15 September 1993 and 30 September 1993 two Notices of Opposition against the granted patent were filed, in which the revocation of the patent in its entirety was requested on the grounds set out in Article 100(a) and (b) EPC (Opponent I) and Article 100(a), (b) and (c) EPC (Opponent II).

III. The oppositions were supported *inter alia* by the following documents:

- D1: P. Ehrlich et al., "Fundamentals of the Free-Radical Polymerization of Ethylene", Adv. Polymer Sci., Vol. 7, (1970), pages 387-395;
- D2: US-A-3 520 861;
- D3: DE-B-1 520 497;
- D4: EP-A-0 017 299;
- D5: GB-A-1 096 945;
- D6: US-A-4 173 669;

- D7: DE-A-2 812 837;
D8: US-A-4 248 990; and
D9: K. Yamamoto et al., "Rate Constant for Long-Chain Branch Formation in Free-Radical Polymerization of Ethylene" J. Macromol. Sci.-Chem. A13(8), (1979), pages 1067-1080.

IV. By a decision issued in writing on 23 October 1997, the Opposition Division revoked the patent. That decision was based upon the set of twelve claims as granted as the main request, a set of twelve claims (Claims 1 and 9 as amended in the course of the opposition proceedings and Claims 2 to 8 and 10 to 12 as granted) as the first auxiliary request and a set of eight claims (Claims 1 to 8 as granted) as the second auxiliary request.

The Opposition Division held that none of the requests fulfilled the requirements of Article 83 EPC since the skilled worker was not informed about the exact conditions necessary for reaching the MWD boundary, and, even if the MWD boundary could be determined, it would lay an undue burden of experimentation upon the shoulders of the skilled person.

- V. On 17 December 1997 the Patentee lodged an appeal against the above decision.
- VI. In its decision T 1218/97 of 14 March 2000 the Board of Appeal considered that the requirements of Article 83 EPC had to be regarded as fulfilled, and remitted the case to the Opposition Division for further prosecution on the basis of Claims 1 to 8 of the second auxiliary request (corresponding to Claims 1 to 8 as granted).

VII. By a decision announced on 15 October 2003 and issued in writing on 1 December 2003, the Opposition Division held that the grounds of lack of novelty and lack of inventive step did not prejudice the maintenance of the patent in amended form on the basis of Claims 1 to 8 filed as main request with letter dated 8 January 2001, which corresponded to Claims 1 to 8 as granted.

The decision held that Claims 1 to 8 of the main request met the requirements of Articles 123(2), 123(3) and 84 EPC.

According to the decision, D1, D9 and D16 (P. Ehrlich et al., "Fundamentals of the Free-Radical Polymerization of Ethylene", Adv. Polymer Sci., Vol. 7, (1970), pages 428, 429 and 431 (cited during the appeal proceedings)) did not refer to the specific interpolymers according to the patent in suit, and D2 to D8 did not mention the MWD boundary.

Concerning document D8, the decision further stated that the tests 2 and 2' submitted by the Opponent II with its letter dated 4 September 2003 (cf. declaration by Mr. Powell dated 3 September 2003) could not be considered as proper repetitions of Comparative Example 6 of D8.

Concerning inventive step, document D2 was considered as representing the closest state of the art. Starting from D2 the technical problem was seen in providing a process for preparing homogeneous random interpolymers of ethylene with a comonomer selected from the group comprising acrylates, methacrylates, vinyl esters and

unsaturated carboxylic acids having better gel rating than those of D2 while maintaining a low molecular weight distribution.

According to the decision, the examples of the patent in suit showed that this problem was solved by the claimed process.

The decision held that D2 was silent about the problems caused by gel formation and that the declaration of Mr. Waples of 19 March 1994 (annexed to the letter of Patentee of 29 June 1994) concerning run 19 of Example 1 of D2 did not form part of the disclosure of D2. It further held that D1, D4, D8, D9 and D16 were not directed to homogeneous random interpolymers of ethylene with at least one comonomer selected from the group comprising acrylates, methacrylates, vinyl esters and unsaturated carboxylic acids and that D3, D5, and D6 were silent about gel formation. Thus, the Opposition Division came to the conclusion that the subject-matter of the main request involved an inventive step.

VIII. Notices of Appeal were filed on 6 February 2004 by the Opponent II, and on 11 February 2004 by Opponent I. The prescribed fees were paid on the respective same dates.

IX. In the Statement of Grounds of Appeal filed on 1 April 2004, the Opponent II argued essentially as follows:

(i) Concerning novelty:

(i.1) In the Notice of Opposition, it had been demonstrated that the temperatures and pressures in the

processes of Comparative Examples 1 to 6 of D8 were similar or higher than those used in the examples of the patent in suit; i.e. that the MWD boundary had been exceeded.

(i.2) The processes of Comparative Examples 4 to 5 of D8 were clearly carried above the MWD boundary (cf. also tests made Prof. Mc.Hugh and Prof. Luft submitted with the Notice of Opposition).

(i.3) The several reworking of Comparative Example 6 of D8 clearly showed that the process of this example was carried above the MWD boundary.

(i.4) Document D8 was a document of Opponent II. Thus, the exact conditions of Comparative Example 6 were known. This guaranteed a correct reworking.

(i.5) These circumstances pointed towards an overall probability that the process of Comparative Examples 1 to 6 would be above the MWD boundary.

(i.6) The Opposition Division, however, seemed to require that novelty could only be challenged if there were perfect proofs. This requirement, was, in the Appellant's view not correct.

(i.7) The Table on page 5 of the Statement of Grounds of Appeal clearly showed that Comparative Examples 1 to 6 of D8 have been carried out above the MWD boundary.

(i.8) The tests submitted in the declaration of Mr. Powell of 19 June 1995, showed that the comparative examples of D8 were carried above the MWD boundary.

(i.9) In its letter to Mr. Evans of 10 March 1992, the Patentee had acknowledged that the Nucrell resins of the Opponent II infringed its patent. Nucrell resins were made under the conditions described in comparative examples of D8 (cf. declaration of Mr. Powell annexed to the letter of 19 June 1995).

(i.10) Comparative Example 6 had been reworked several times, and it always gave the same result, that the temperature and the pressure would have been above the MWD boundary.

(i.11) The replacement of benzene by mineral spirit would not change this result considering the overall balance of probability.

(i.12) The declaration by Dr. Bruce Hasch dated 29 March 2004 annexed to the Statement of Grounds of appeal confirmed that a fair and correct reworking of Comparative Example 6 of D8 had been made.

(ii) Concerning inventive step:

(ii.1) D2 should be taken as closest state of the art.

(ii.2) In run 19 of Example 1 of D2, the conditions were indisputably above the single phase boundary.

(ii.3) According to the declaration of Mr. Waples of 19 March 1994, one of the inventors of D2, the product of run 19 had too many gels.

(ii.4) Starting from D2 the technical problem could be seen as providing a process for preparing interpolymers having better gel rating and maintaining their low molecular weight distribution.

(ii.5) In view of D1 (page 431) it was evident that, in order to avoid microgels one should work well above the two-phase boundary. This teaching would also apply to copolymerization of ethylene.

(ii.6) Thus, the simple combination of D2 with D1 led to the claimed process.

(ii.7) From D9 it was further known that increasing the reaction pressure while maintaining the temperature led to a decrease in MWD and that keeping the pressure constant while increasing the temperature led to an increase of the MWD (pages 1073, Table 1; page 1075, Table 2, Runs 1 to 5, and Runs 6 to 10).

(ii.8) It was hence evident from D9 that by increasing both temperature and pressure, a maximum in MWD was obtained.

(ii.9) Thus, it was a matter of simple routine test, to find whether the same behaviour applied to the process of D2.

X. By a communication dated 17 May 2004 sent by registered letter with advice of delivery, the Registry of the Board informed the Opponent I that no Statement of Grounds had been filed and that the appeal could be expected to be rejected as inadmissible. The Appellant

was given the opportunity of filing observations within two months and attention was drawn to Article 122 EPC.

XI. With its letter dated 22 November 2004, the Respondent (Patentee) submitted the following documents:

D20: P. Ehrlich et al., "Fundamentals of the Free-Radical Polymerization of Ethylene", Adv. Polymer Sci., Vol. 7, (1970), pages 386-448; and

a declaration by Prof. Michael Buback dated 18 November 2004.

It also argued essentially as follows:

(i) Concerning novelty:

(i.1) The tests mentioned in the declaration of Prof. Buback showed that the synthesis conditions of Comparative Example 6 of D8 were not beyond the MWD boundary.

(i.2) Comparative Examples of D8 dealt with copolymers of ethylene with methacrylic acid. The Examples of the patent in suit related, however, to copolymers of ethylene with acrylic acid.

(i.3) The MWD boundary of ethylene acrylic acid copolymers would not coincide with the MWD boundary of ethylene methacrylic acid copolymers.

(i.4) The tests made by Mr. Luft and Mr. McHugh were not significant because they used methacrylic acid as comonomer and cyclohexane as telogen, and did not

contain any measurement showing that they were above the MWD boundary.

(i.5) The declaration of Mr. Powell annexed to the letter of 19 June 1995 of the Appellant referred only to an unspecified mathematical model of synthesis conditions.

(i.6) The claims of the patent in suit were directed to a process. Thus, the arguments based on polymers sold before the priority date were irrelevant.

(i.7) The Appellant did not provide sufficient proof that the repetitions of the comparative example of D8 was conducted according to D8.

(i.8) The tests of the Appellant showed that the highest MWD was close to the boundary between one-phase and two-phase regions. This was contrary to the teaching of the patent in suit. The experiments of Prof. Buback showed that the MWD values around the phase boundary were lower than those obtained at higher reaction conditions until the MWD boundary was reached.

(i.9) Thus, it was evident that the process of Comparative Example 6 of D8 was performed before the MWD boundary.

(ii) Concerning inventive step:

(ii.1) The aim of the patent in suit was to provide ethylene copolymers with improved optical and coating properties.

(ii.2) Starting from D2, it had surprisingly been found that interpolymers with improved optical properties could be obtained by using conditions of pressure and temperature which were simultaneously increased while maintaining the melt index and the comonomer content constant.

(ii.3) While the declaration of Mr. Waples indicated that the interpolymers of D2 contained many gels and had poor optical properties, D2 was totally silent on these points.

(ii.4) D2 did not mention the problem underlying according to the patent in suit and did not contain any teaching which would lead the skilled person to the claimed process.

(ii.5) D1 was concerned with the homopolymerization of ethylene.

(ii.6) D20 which was the complete article from which D1 and D16 originated. In that respect, the reference to microgel formation due to drop of pressure and temperature made by the Opponent II was indeed related to the homopolymerization of ethylene in tubular reactors (cf. page 430 of D20).

(ii.7) The claimed process however related to copolymerization in an autoclave reactor.

(ii.8) Furthermore D20 connected the broadening of the MWD which occurred when increasing pressure and temperature above the two-phase conditions with gel formation (page 431, lines 11 to 13).

(ii.9) In document D9 there was no teaching concerning a simultaneous increase of temperature and pressure and therefore no teaching of any possible maximum of MWD.

(ii.10) Thus, cited prior art could not render obvious the claimed process.

XII. With its letter dated 7 June 2005, Opponent II requested, as precautionary measure, the continuation of the appeal proceedings. Reference was made to decision T 329/88 of 22 June 1993 (not published in OJ EPO).

XIII. With its letter dated 15 June 2005, the Opponent I informed the Board that it would not be represented at the oral proceedings scheduled to take place on 29 June 2005 before the Board.

XIV. With its letter dated 27 June 2005, the Opponent II submitted additional experimental data. It also argued essentially as follows:

(i) The data presented in the declaration of Mr Powell of 3 September 2003 demonstrated that Comparative Example 6 of D8 fell beyond the MWD boundary, according to the text defined in section 6.2 of the decision T 1218/97.

(ii) While a decision concerning the non-enabling disclosure had already been reached by the Board of Appeal in its decision T 1218/97, the binding effect was given only in so far the facts were the same.

(iii) The declaration of Dr. Buback of 18 November 2004 raised the question, however, of whether the polymers were made under constant conversion (i.e. constant polymer concentration in the reaction mixture) or variable conversion (i.e. variable polymer concentration in the reaction mixture).

(iv) It had been the position of the Opponent II that the claimed process should be carried with constant monomer concentration and constant melt index but also with constant conversion.

(v) This was supported by Claim 1 according to which the process was carried out under substantially constant environment, i.e. excluding, in the Opponent's view, a variable conversion which would not ensure a constant environment.

(vi) While the issues of constant melt index and constant monomer concentration had been dealt with in the decision T 1218/97, the issue of constant conversion had not been discussed in that decision.

(vii) According to the declaration of Dr. Buback of 18 August 2003 (annexed to the letter of 18 August 2003 of the Patentee; i.e. filed after the issuing of decision T 1218/97), it had been submitted by the Patentee, that the conversion rate should not be kept constant (cf. page 4, last two lines of the declaration).

(viii) In view of the experimental data referred to in the tests submitted by Dr. Buback in its declaration of 18 November 2004 and its previous statements concerning

the conversion rates, Opponent II had decided to carry out further experiments using variable conversion.

(ix) These further tests showed that the MWD boundary could only be found provided a variable conversion rate was used. They further showed that the type of initiator was relevant for finding the MWD boundary.

(x) The data submitted by Dr. Buback in his declaration of 18 November 2004 and the data submitted annexed to the letter of 27 June 2005 of the Opponent represented new facts which authorized the Board to reopen the discussion on non-enabling disclosure.

(xi) Thus, revocation of the patent on the grounds of non-enabling disclosure was requested.

XV. In its letter dated 28 June 2005, the Patentee made in substance, the following submissions:

(i) With its letter dated 27 June 2005, the Opponent II had referred to new facts and filed new tests reports.

(ii) The late filing of these documents, the penultimate day before the oral proceedings represented a deliberate abuse of proceedings.

XVI. Oral proceedings before the Board were held on 29 June 2005, in the absence of the Opponent I.

At the oral proceedings, the discussion focussed on

(i) the admissibility of the objection under Article 100(b) EPC raised by the Opponent II in its letter of 27 June 2005, (ii) the interpretation of

Claim 1, (iii) on the assessment of novelty and (iv) the assessment of inventive step.

The arguments presented by the Parties in respect of these issues may be summarized as follows:

(i) Concerning the admissibility of the objection under Article 100(b) EPC.

(i.a) While relying on its submissions made in its letter of 27 June 2005, the Opponent II made the following additional statements:

(i.a.1) It was only 11 years after the beginning of the opposition procedure, that the Patentee had submitted a repetition of the Comparative Example 6 of document D8 (cf. declaration of Dr. Buback of 18 November 2004).

(i.a.2) Due to the severe illness of the representative of the Opponent II at that time, a new representative had had to take over the case in February 2005.

(i.a.3) In order to have a chance to respond to the tests submitted by Dr. Buback in November 2004, new tests were carried out in March 2005 by the Opponent II. The results thereof were communicated to the other parties as soon as they were available (June 2005).

(i.a.4) The tests made the Opponent II showed that the use of a variable conversion was an essential feature of the claimed process.

(i.a.5) The issue concerning the use of a variable conversion rate had not, however, been dealt with in the decision T 1218/97.

(i.a.6) This would represent a new fact justifying a reopening of the discussion on insufficiency.

(i.b) By the Patentee:

(i.b.1) There were no new facts justifying the reopening of the discussion on insufficiency.

(i.b.2) The claims and the description were the same as those on which the decision T 1218/97 was based.

(i.b.3) The Opponent II was aware of the use of variable conversion well before the declaration of Dr. Buback of 18 November 2004. Reference was made to the first declaration of Dr. Buback of 18 August 2003, and to the letter of the Opponent II of 25 July 2002 (page 3, third paragraph).

(i.b.4) In view of the severe illness of the representative of the Opponent II, it would have been possible for Opponent II to ask for a postponement of the oral proceedings, instead of waiting to the very last moment for submitting the new experimental data.

(i.b.5) It was already the second time that the Opponent II submitted experimental data at a very short notice before oral proceedings (cf. also submissions of the declaration of Mr. Powell of 3 September 2003).

The Board, having, after deliberation, informed the Parties that the objection of insufficiency would be disregarded, the discussion moved to the interpretation of Claim 1 in view of the features "constant environment" and "steady state conditions" in that claim in the light of the submissions of the Parties concerning the use of a variable conversion rate.

(ii) Concerning the interpretation of Claim 1:

(ii.a) By the Opponent II:

(ii.a.1) From the patent in suit it was clear that the requirement for a constant environment implied a constant conversion rate, i.e. a constant polymer concentration.

(ii.a.2) Reference in that respect was made to page 3, lines 4 to 5, to page 5, lines 9 to 10, and to page 6, lines 14 to 17, which referred to a constant polymer concentration.

(ii.a.3) It was not the temperature in the reactor but the difference between the temperature in the reactor and the feed temperature which regulated the conversion rate. Thus, a constant conversion rate could be obtained by varying the temperature in the reactor.

(ii.a.4) The examples of the patent in suit gave no indication either upon the feed temperature or upon the reactor temperature.

(ii.a.5) The MWD was dependent on temperature, pressure and conversion rate. In order to determine the effect

of temperature and pressure, the conversion should be maintained constant.

(ii.a.5) By working under a stable conversion rate no MWD boundary had been observed by the Opponent II.

(ii.b) By the Patentee

(ii.b.1) Claim 1 was directed to the manufacture of a copolymer and required that the polymerization should be carried under steady conditions. Claim 1 further required that the process should be carried at a synthesis conditions (temperature and a pressure) corresponding to the conditions at or above the MWD boundary.

(ii.b.2) Distinction should however be made between the constant environment for carrying out the copolymerization process, and the mapping process used for determining the MWD boundary.

(ii.b.3) For the mapping process, the melt index and the comonomer concentration were maintained constant, and the synthesis conditions were changed (pressure, temperature).

(ii.b.4) The increase of temperature during the mapping process freely led to an increased conversion. In that respect document D9 (cf. Table 1 thereof) showed that an increase of the reactor temperature generated a corresponding increase of the conversion.

(ii.b.5) Page 3, lines 3 to 5 of the patent in suit related to the mapping process, i.e. increasing the

synthesis conditions in respect to the conditions corresponding to the phase boundary at a given polymer concentration.

(ii.b.6) Following observations from the Board concerning the meaning of the requirements of Claim 1 according to which the pressure should be greater than 14 MPa and the temperature be greater than 15°C above the required conditions at the phase boundary, the Patentee indicated that these indications should be read in the context of the mapping process and furthermore that they represented a further distinction over document D8 which had been introduced in Claim 1 in the course of the examining procedure in order to meet an objection raised by the Examining Division in view of D8.

(ii.b.7) The passage on page 5, lines 9 to 10 referred to the comparison between copolymers obtained according to the process of the patent in suit and copolymers obtained according to processes of the prior art. In order to have a fair comparison, the polymer concentration and the comonomer concentration had to be kept the same.

After deliberation, the Board informed the Parties that, even if the meaning of the requirement in Claim 1 for the elevated pressure to be greater than 14 MPa (2000 psi) above, and the elevated temperature to be greater than 15 °C above the synthesis conditions required at the phase boundary for a given mixture of ethylene and comonomer was not precisely limiting, the claim nevertheless contained the further limitation that the process was characterized by the use of

synthesis conditions of temperature and pressure which were elevated to a level high enough above the phase boundary between two-phase and single-phase operation such that the MWD boundary was reached, or surpassed, this latter parameter according to T 1218/97 (Reasons 4.1) being defined.

(iii) Concerning novelty, the Board having informed the Parties of its preliminary opinion, according to which it would be unlikely that Comparative Example 6 of D8 could be demonstrated to fall under the scope of Claim 1 in view of the lack of detailed information in the description of that example in D8, both Parties indicated that they did not intend to present further submissions in respect of the issue of novelty.

(iv) Concerning inventive step:

(iv.a) By the Opponent II:

(iv.a.1) Document D2 or D8 could be taken as a starting point.

(iv.a.2) When starting from D2, the technical problem was seen as improving the gel rating to a value of 3 or less.

(iv.a.3) This problem was solved according to the process of the patent in suit by increasing the temperature and the pressure.

(iv.a.4) In that respect, Opponent II submitted a diagram showing, in its opinion, that the gel rating obtained in the Examples and Comparative Examples of

the patent in suit linearly decreased with the increase of pressure, and that there was no link between the MWD and the gel rating.

(iv.a.5) It was however known from document D20 (cf. page 431, lines 42 to 43) that microgels could be reduced when avoiding pressure and temperature drops into the two-phase region.

(iv.a.6) Although this passage of D20 would appear to relate to a process in tubular reactors, it was evident in view of page 432, lines 8 to 10 of D20 thereof that these teachings were also applicable to stirred autoclaves.

(iv.a.7) It was known in the art, as admitted by the Patentee (cf. letter of 25 October 1995, page 6), that microgels were occasioned by working near the two-phase region.

(iv.a.8) Furthermore, it was known that a high pressure and high temperature limited the molecular weight of the copolymer obtained, and thus the formation of microgels which were nothing else than very high molecular weight molecules.

(iv.a.9) Thus, it would have been obvious to work at synthesis conditions well above the phase boundary in order to improve the gel rating.

(iv.a.10) The copolymers obtained according to Comparative Example 6 of D8 exhibited a gel rating of 3 (cf. Example D of Table II of the declaration of Mr. Powell of 17 August 2003). This value corresponded

to the value according the patent in suit (cf. Examples 6 and 9 thereof).

(iv.a.11) Thus, starting from D8, the technical problem was seen as to provide an alternative process for producing copolymers having a gel rating as low as 3.

(iv.a.12) Varying the temperature and the pressure would represent an obvious alternative.

(iv.a.13) The Opponent II, however, conceded that it could not submit documents establishing a link between the presence of microgels and the heat seal and hot tack strengths.

(iv.b) By the Patentee:

(iv.b.1) The process according to the patent in suit provided copolymers having not only low gel rating but also transparency, improved heat seal strength and hot tack strength, and under specific conditions having a narrow MWD. The examples of the patent in suit showed that the gel rating, the heat seal strength and the hot tack strength were clearly improved by using synthesis conditions of pressure and temperature sufficiently high to reach or surpass the MWD boundary.

(iv.b.2) D20 at page 431 was concerned by homopolymerization of ethylene in tubular reactors. The claimed process was directed to copolymerization in a well stirred autoclave.

(iv.b.3) Furthermore the skilled person would have expected that by increasing the temperature, the MWD

would also increase. According to D20, page 431, lines 9 to 13, a broadening of the MWD would result in gel formation.

(iv.b.4) Thus D20 could not suggest the solution proposed in the patent in suit.

(iv.b.5) In Table II of the declaration of Mr. Powell of 17 August 2003, reference was made to a microgel ranking. No comparison could be made between this microgel ranking and the gel rating according to the patent in suit.

(iv.b.6) Thus, the claimed process could not be rendered obvious by the combination of D2 or D8 with D20.

XVII. The Appellant (Opponent II) requested that the decision of the Opposition Division be set aside and the European patent No. 146 620 be revoked.

The Respondent (Patentee) requested that the appeal be dismissed.

The Opponent I, beyond requesting that the decision of the Opposition Division be set aside made no further request.

Reasons for the Decision

1. *Admissibility of the appeal by the Opponent II and continuation of the appeal proceedings*
 - 1.1 The appeal of Opponent II is admissible.
 - 1.2 With its letter dated 7 June 2005, the Opponent II requested the continuation of the appeal proceedings and made reference in that respect to the decision T 329/88.
 - 1.3 In the present case, in contrast to the case dealt with in decision T 329/88, no confirmation of surrender or lapse of the European Patent No. 146 620 has been received by the EPO from the appropriate authorities of all the designated states.
 - 1.4 Nor was the EPO under legal obligation to ascertain of its motion the legal status of a European Patent (cf. T 194/88 of 30 November 1992; not published in OJ EPO).
 - 1.5 It thus follows that no notification had been issued by the EPO informing the Opponent II of the surrender or lapse of the patent in all designated states.
 - 1.6 Consequently, the conditions for applying Rule 60(1) EPC not being met in the present case, there was no need for the Opponent II to request the continuation of the appeal proceedings.
 - 1.7 Hence, the Board sees no reason to give a decision in respect of this request.

2. *Admissibility of the appeal by the Opponent I*

2.1 As indicated in Section VIII above, the Opponent I filed a Notice of Appeal on 11 February 2004 and paid the fee for appeal on the same date.

2.2 No Statement of Grounds has been filed and the Notice of Appeal contains nothing that could be regarded as a statement of grounds pursuant to Article 108 EPC.

2.3 No answer to the Registry's communication dated 17 May 2004 mentioned above in Section X has been received.

2.4 As no written statement setting out the grounds of appeal has been filed, the appeal of the Opponent I has to be rejected as inadmissible (Article 108 EPC in conjunction with Rule 65(1) EPC).

3. *Admissibility of the request for reopening of the issue of non-enabling disclosure*

3.1 As mentioned above in Section VIII, the Notice of Appeal of the Appellant (Opponent II) was received on 6 February 2004. Consequently the new Rules of Proceedings of the Boards of Appeal (below RPBA) according to the decision of the Administrative Council of 12 December 2002 (OJ EPO 2003, 61) apply to the present case.

3.2 According to Article 10(a)(2) RPBA, the Statement of Grounds of Appeal shall contain a party's complete case, and according to Article 10(b)(1) RPBA, any amendment to a party's case after it has filed its grounds of

appeal may be admitted and considered at the Board's discretion, and this discretion shall be exercised in view of *inter alia* the complexity of the new subject matter submitted, the current state of the proceedings and the need for procedural economy.

3.3 As indicated above in paragraph XIV, the Appellant in its letter dated 27 June 2005 submitted that the discussion on the sufficiency of disclosure of the patent in suit should be reopened and requested that the patent be revoked for lack of sufficient disclosure (Article 100(b) EPC).

3.4 Independently of the question as to whether the alleged new facts presented by the Appellant in support of its request for reopening the debate on insufficiency might authorize the Board to reconsider this question in view of the binding effect of the decision T 1218/97 in that respect, it is in any case evident that this request presented by the Appellant for the first time with its letter dated 27 June 2005 indisputably represents an amendment to its case in the sense of Article 10(b)(1) RPBA, and that the admission of this request is, hence, at the discretion of the Board.

3.5 While Article 10(b)(1) RPBA mentions factors such as the complexity of the new subject-matter, the current state of the proceedings, and the need for procedural economy as factors which might be taken into account by the Board when exercising its discretion, it does not give a restrictive list thereof. In the Board's view, the request by a Party for resuming discussion of an issue already decided by the Board of Appeal in an earlier decision, which is presented at a very late

stage of the appeal proceedings without cogent reasons for the delay, would also justify it to make use of its discretion according to Article 10(b)(1) RPBA not to admit it.

3.6 In the present case, when trying to justify its late request for reopening the question of sufficiency of disclosure, the Appellant submitted:

(i) that it was proceeding over the years in the opposition proceedings from the viewpoint that the claimed process had to be run not only with constant comonomer concentration and constant melt index, but also with constant conversion;

(ii) that, however, in view of the declaration of Prof. Buback dated 18 August 2003, it could be concluded that the conversion should not be kept constant;

(iii) that, it was only in view of the differences between the results obtained by Prof. Buback and discussed in his declaration of 18 November 2004 and the results of the tests carried out by the Appellant presented in the declaration of Mr. Powell of 3 September 2003, that the Appellant assumed that these differences might be explained by the use of a variable conversion instead of a constant conversion;

(v) that due to the severe illness of the Representative of Opponent II, the decision of carrying out further tests could be taken only in February 2005, when a new Representative took over the case;

(vi) that these tests were carried out in March 2005, and that the results were only known in June 2005 and immediately communicated to the Patentee,

(vii) that these tests showed that a MWD boundary was apparently only found when conversion was allowed to vary, and that the type of initiator used was apparently relevant for the finding of a MWD boundary, and

(viii) that, since the point of using a variable or a constant conversion and the point of using specific initiators had not been dealt with in the decision T 1218/97, these new facts would authorize the Board to reopen the discussion on non-enabling disclosure.

3.7 In this connection, the Board, firstly, observes that the question of using a variable or a constant conversion and its influence on the MWD curve was already raised by the Appellant in its letter dated 25 July 2002 (page 3, third paragraph). Furthermore, it cannot be disputed that the declaration of Prof. Buback of 18 August 2003 clearly stated that the conversion should not be held constant, and that the letter of the Patentee of 18 August 2003 expressly mentioned that the Appellant tests were improperly carried out at constant concentration (cf. page 5, paragraph c). It thus follows, in the Board's view, that the Appellant was well aware of this essential difference between the mapping procedure according to its own tests and the mapping procedure used in the patent in suit about 2 months prior the oral proceedings before the Opposition Division (i.e. 15 October 2003), so that the Board cannot see any justification for the late filing

(i.e. only 2 days prior the oral proceedings before the Board) of the results of experimental data which led the Appellant to request the reopening of the question of the sufficiency of disclosure. The same conclusion applies for the submissions relating to the type of initiator presented in the letter of 27 June 2005 of the Appellant, since Prof. Buback in his declaration dated 18 August 2003 clearly indicated that changing the initiator might have a significant effect on the molecular weight distribution (cf. page 3, point 8).

3.8 Furthermore, it had been admitted in the letter of 27 June 2005 of the Appellant that the question of constant variation versus variable conversion had been also an issue at the oral proceedings of 15 October 2003 before the Opposition Division.

3.9 Consequently, the Board cannot accept the argument of the Appellant that it was the declaration of Prof. Buback of 18 November 2004, which caused let it to realize the importance of the mode of conversion (constant or variable) and of the type of initiator and, hence, their possible influence on the MWD curve, i.e. on the presence of a MWD boundary. This also implies that the fact that a change of Representative had occurred in February 2005 due to the severe illness of the previous Representative is *de facto* of no relevance for justifying the late filing of the request for reopening the issue of non-enabling disclosure.

3.10 Thus, under these circumstances, the Board sees no justification for the late filing of the request for reopening the discussion on non-enabling disclosure,

and makes use of its discretion not to admit this request according to Article 10(b)(1) RPBA.

4. *Interpretation of Claim 1*

4.1 In the Board's view, when interpreting Claim 1 in the light of the description of the patent in suit, distinction should be made between the process for producing homogeneous, random interpolymers of ethylene and at least one olefinically unsaturated comonomer selected from the group comprising acrylates, methacrylates, vinyl esters and olefinically unsaturated carboxylic acids which is the subject-matter of Claim 1, and the mapping process which is used to determine the synthesis conditions of temperature and pressure which must be used in the claimed process.

4.2 In that respect while the process for producing the homogeneous random interpolymers must be carried out in a substantially constant environment and under steady state conditions, it is, however, evident, in the Board's view, that the mapping process used in the determination of the MWD boundary is made at constant product melt-index and comonomer concentration while increasing the synthesis conditions (cf. page 4, lines 52 to 55; Figure 1). Since only melt-index and comonomer content are explicitly said to be maintained constant during the mapping process, this implies, in the absence of explicit indication to the contrary, that the increasing of the synthesis conditions, i.e. pressure and temperature, inevitably generates a change in the conversion during the mapping process.

- 4.3 Consequently, while the interpretation of Claim 1 is hence to be made under the assumption that the mapping process used for determining the MWD boundary is carried out using a variable conversion, it also follows from the above that no contradiction can be seen between the requirements of a constant environment and of steady state conditions for the process of producing the interpolymers on the one hand, and the variable conversion associated with the determination of the MWD boundary during the mapping process on the other.
- 4.4 Nevertheless, in view of the reference to the feature "phase boundary" in both the mapping process and the process for producing the interpolymers, the meaning of the requirement in Claim 1 for the elevated pressure to be greater than 14 MPa (2000 psi) above, and the elevated temperature to be greater than 15°C above the synthesis conditions required at the phase boundary for a given mixture of ethylene and comonomer, is, in the Board's view, not precisely limiting, since it cannot be ascertained whether this feature refers to the synthesis conditions used as starting point for the mapping process i.e. at a specific conversion and polymer concentration (cf. Fig 1) or to the synthesis conditions at the phase boundary at the actual conversion and polymer concentration used in the process for producing the interpolymers.
- 4.5 Consequently, Claim 1 is to be interpreted as being directed to a copolymerization process in a constant environment and under steady state conditions, in a single phase operation mixture, characterized in that it is carried out under synthesis conditions of

temperature and pressure which are elevated to a level high enough above the phase boundary between two-phase and single-phase operation such that the MWD boundary was reached, or surpassed, that parameter being also defined (cf. also T 1218/97, point 4.1) but no precise limitation of the claimed subject-matter could be seen in respect of the feature that said elevated pressure being greater than 14 MPa (2000 psi) above, and said elevated temperature being greater than 15°C above the synthesis conditions required at the phase boundary for a given mixture of ethylene and comonomer.

5. *Novelty*

5.1 Lack of novelty of the subject-matter of Claim 1 of the patent in suit has been alleged by the Appellant in view of Comparative Examples 1 to 6 of document D8, and more particularly in view of comparative Examples 4 to 6.

5.2 Document D8 relates to a process for preparing in a constant environment stirred autoclave a compositionally uniform but nonrandom copolymer of ethylene and an α,β -ethylenically unsaturated carboxylic acid, said acid having from 3 to 8 carbon atoms and said copolymer containing, on a weight basis, from 6 to 35 percent acid, having a melt index of from 0.1 to 800, and having a ratio of weight percent adjacent acid to weight percent acid in the copolymer of from 0.44 to 1.0, said process comprising continuously charging ethylene, said acid and free radical initiator into a reaction zone maintained in a steady state at a pressure of from 0 to about 500 psi above, and at a temperature of from 0°C to about 15°C above that needed

to maintain a single phase reaction mixture at the given concentration of copolymer in the reaction mixture and at the given acid comonomer concentration in the copolymer, the ethylene and acid being charged in a ratio of from 15:1 to 200:1, respectively, converting from 5 to 20 percent by weight of the monomers to copolymer, and continuously removing the copolymer and unreacted monomer from the reaction zone (column 1, line 59 to column 2, line 36).

- 5.3 As mentioned in D8, at synthesis temperatures and pressures above the range specified above in paragraph 5.2, the copolymers are substantially random and hence have lower ratios of percent adjacent acid to total weight percent methacrylic acid and thus do not have improved properties.
- 5.4 According to D8 the processes of Comparative Examples 1 to 6 were carried out either in a continuous manner in a 0.72-liter, 2000-atmosphere autoclave having a L/D of 1.24 that had a central agitator shaft carrying several sets of pitched paddle blades and turning at about 1200 rpm to mix the continuously added feed mixture thoroughly with the reaction mixture already in the autoclave to provide a constant environment (Comparative Examples 4 to 6) or in a similar autoclave of 2.0 liter capacity having a L/D of 3.3 and likewise stirred at 1200 rpm in order to provide a constant environment (Comparative Examples 1 to 3). The autoclave was externally heated to maintain the chosen temperature inside. The feed mixture comprised ethylene and methacrylic acid in the proportion needed to make the desired copolymer and a separate feed consisting of a solution of an appropriate initiator in benzene. The

feed rate was about 10 lbs/hr and the hold-up time in the reactor was about four minutes. Conditions in the reaction zone were maintained in a steady state (column 6, lines 7 to 28). According to Table 1 of D8, the synthesis temperature in Comparative Examples 1 to 6 was between 205°C (Comparative Example 4) and 251°C (Comparative Example 6), and the pressure was between 24 KPSI (Comparative Example 1) and 27.2 KPSI (Comparative Example 3), so that it can be concluded that comparative Examples 1 to 6 were carried under conditions which according to D8 lead to random copolymers.

- 5.5 As indicated above in paragraph 4.5, the process according to Claim 1 is characterized in that it is carried out under synthesis conditions of temperature and pressure which are elevated to a level high enough above the phase boundary between two-phase and single-phase operation such that the MWD boundary was reached, or surpassed.
- 5.6 In that respect, it is immediately evident that D8 contains no explicit disclosure as to whether the processes of comparative Examples 1 to 6 were carried out at a temperature and a pressure which were elevated to a level high enough above the phase boundary between two-phase and single-phase operation such that the MWD boundary was reached, or surpassed.
- 5.7 According to decision T 793/93 of 27 September 1995 (not published in OJ EPO), "concerning the issue of novelty, Article 54(2) EPC defines a state of the art as comprising "everything made available to the public by means of written or oral description, by use or in

any other way. The term "available" clearly goes beyond literal or diagrammatical description, and implies a communication, express or implicit, of technical information by other means as well. In the case where a prior art document fails explicitly to disclose something falling within a claim, availability in the sense of Article 54 may still be established if the inevitable outcome of what is literally or explicitly disclosed falls within the ambit of that claim"

(Reasons 2.1). As further stated in decision T 793/93 "in deciding what is or is not the inevitable outcome of an express literal disclosure in a particular prior art document, a standard of proof much stricter than the balance of probability, to wit "beyond all reasonable doubt", needs to be applied. It follows that if any reasonable doubt exists as to what might or might not be the result of carrying out the literal disclosure and instructions of a prior art document, in other words if there remains a "grey area", then the case on anticipation based on such a document must fail" (Reasons 2.1).

5.8 In that context Comparative Examples 1 to 6 could only be considered as novelty destroying for the subject-matter of Claim 1 provided it could be established beyond any reasonable doubt that they were carried out at a temperature and a pressure which were elevated to a level high enough above the phase boundary between two-phase and single-phase operation such that the MWD boundary was reached, or surpassed.

5.9 When trying to establish that the processes of the Comparative Examples 1 to 6 were carried out at or beyond the MWD boundary, the Appellant has relied, on

the one hand, on a comparison between the synthesis conditions (i.e. pressure and temperature) in the Examples of the patent in suit and those according to Comparative Examples 1 to 6 of D8, and, on the other hand, on a reworking of Comparative Examples 4 to 6.

- 5.10 In this connection, it is, however, noted by the Board, firstly, that the patent in suit discloses neither the temperature and nor the pressure used in the Examples but that it only indicates the differences in temperature and pressure in respect to the conditions at the phase boundary, and secondly that the examples of the patent deal with the copolymerization of ethylene with acrylic acid while the Comparative Examples 1 to 6 of D8 relate to the copolymerization of ethylene with methacrylic acid. This vitiates *ab initio* the comparison made by the Appellant, which hence cannot provide any clue as to whether the Comparative Examples 1 to 6 of D8 have been carried out at or beyond the MWD boundary. Consequently, the first argument of the Appellant cannot succeed.
- 5.11 The second line of argument based on the reworking of Comparative Examples 4 to 6 would presuppose that this reworking is an exact repetition of these comparative examples. In that respect, it is noted by the Board that D8 does not indicate whether or not cyclohexane was used as telogen in these comparative examples, and that it does not disclose the amount of telogen which was possibly used (cf. column 6, lines 48 to 51). Furthermore, it is even less clear, in the Board's view, which type and which amount of initiator have been actually used in these examples, since D8 merely gives examples of initiators which might be used (cf.

column 6, lines 28 to 34). It thus follows that the lack of information on these operative features evidently precludes an exact duplication of these comparative examples of D8, i.e. in other words it would remain a "grey zone" as to whether the conditions (e.g. presence of telogen and amount thereof, initiator type and amount thereof) used in the repetitions inevitably corresponded to the actual conditions used in these comparative examples of D8.

5.12 Since, in the Board's view, the presence of a telogen, the type and amount of initiator may furthermore have an influence on the determination of the MWD boundary, it is evident that the tests presented by the Appellant in the course of the opposition and appeal procedures as reworking of Comparative Examples 4 to 6 cannot demonstrate beyond any reasonable doubt that the processes of these comparative examples were indeed carried out at a temperature and a pressure which were elevated to a level high enough above the phase boundary between two-phase and single-phase operation such that the MWD boundary was reached, or surpassed.

5.13 Consequently, in accordance with the principles set out in T 793/93, the objection of lack of novelty of Claim 1 in view of Comparative Examples 1 to 6 of D8 must fail.

5.14 It thus follows that the subject-matter of Claim 1, and by the same token that of dependent Claims 2 to 8 must be regarded as novel (Article 54 EPC).

6. *Closest state of the art; the technical problem*

6.1 The patent in suit relates to a process for producing random copolymers of ethylene with a comonomer selected from acrylates, methacrylates, vinyl esters and olefinically unsaturated carboxylic acids in a stirred autoclave reactor in continuous single phase operation using free radical initiator.

6.2 Such a process is disclosed in document D2. D2 relates to the manufacture of random copolymers of ethylene with 0.1 to 35% by weight of acrylic, methacrylic or crotonic acid by continuous polymerization in a stirred autoclave under steady state conditions (column 1, lines 14 to 18). These copolymers are obtained by polymerizing mixtures of ethylene and one or more of the specified acid comonomers at pressure of at least 1000 atmospheres, preferably between 1000 and 3000 atmospheres, and at temperature from 120°C to 300°C, preferably from 150°C to about 250°C, in the presence of a free-radical initiator. According to D2 it is also essential to maintain a supply of each of the monomers in the reaction mixture during the course of the polymerization and in order to get substantially homogeneous copolymers, the polymerization is carried out in a reaction mixture which is maintained in a manner such that the polymerization conditions are substantially constant throughout the reaction mixture and throughout the time of the run. The temperature and pressure and the concentration of monomers, of copolymer product and catalysts and other modifiers of the polymerization are all held constant in the reaction mixture which is stirred to insure substantially uniform composition throughout (column 2,

lines 37 to 66). According to D2, it is convenient and effective to carry out the polymerization in a stirred autoclave reactor in a continuous manner, i.e. continuously feeding the starting materials to the well-stirred reaction mixture in the autoclave and continuously withdrawing the reaction mixture from the autoclave at corresponding rates to maintain the system in balance. By feeding the starting materials or mixture thereof in a manner such that the ratio of constituents, including monomers, is maintained on the basis of the reactivity ratios and by maintaining reaction conditions and contact time in the stirred autoclave reactor adjusted to the requirements of the reaction desired, compositionally uniform, homogeneous, random copolymers are obtained (column 3, lines 7 to 21).

- 6.3 As disclosed in D2, the polymerization of the monomers is initiated and promoted by a free radical initiator or catalyst such as oxygen, peroxygen compounds, and azo compound (column 3, line 75 to column 4, line 3). The reaction mixture must be homogeneous, and may contain mutually compatible solvents such as isooctane, cyclohexane, benzene, toluene, chlorobenzene, tert-butyl alcohol, some of which are used as media for introducing the acid comonomer and/or the catalyst, and some of which solvents act as chain transfer agents in the polymerization. The starting ethylene can also contain small amounts of saturated materials such as methane, ethane, propane, butane which are true telogens and/or olefins such as propylene, butene, all of which copolymerize to a minor extent and also terminate growing polymer chains (column 4, lines 12 to 23).

- 6.4 The copolymers of D2 are useful in coatings, adhesives and laminations having improved adhesion, printability and glueability (column 1, lines 22 to 25) and are particularly suitable for extrusion coating (column 7, lines 66 to 69).
- 6.5 The object of the patent in suit, as mentioned on page 3, lines 39 to 41 is to provide random copolymers having in particular excellent extrusion coating properties, reduced microgel level, improved hot tack strength and increased heat seal strength.
- 6.6 While D2 has been considered as the closest state of the art in the decision under appeal, the Appellant, at the oral proceedings before the Board, submitted that Comparative Example 6 of D8 could also represent an appropriate starting point for the assessment of inventive step.
- 6.7 According to the Appellant the repetition of Comparative Example 6 as disclosed in the declaration of Mr. Powell of 17 August 2003 (cf. Table I, Example D; Table II, Example D), showed that the copolymer obtained in that comparative example exhibited the same microgel ranking as obtained in the Examples 6 and 9 of the patent in suit. Consequently, in the Appellant's view, starting from this comparative example of D8 the technical problem should be in the provision of an alternative process for making random copolymers having a low microgel content (i.e. a microgel ranking of 3).
- 6.8 In that respect, the Board observes that document D8 itself gives absolutely no information on the microgel

content of the polymer obtained in its Comparative Example 6. Furthermore, independently of the question of repeatability of Comparative Example 6 (cf. point 5.11 above), the Board notes that the Appellant itself has admitted, that the tests discussed in the declaration of 17 August 2003 deviated from the test protocol established for the repetition of Comparative Example 6 of D8 (cf. declaration of Mr. Powell of 3 September 2003, page 3, lines 3 to 12). Consequently, it is evident, in the Board's view, that no reliable information on the microgel content of the copolymers of Comparative Example 6 of D8 can be derived from this repetition.

6.9 The closest state of the art should normally be represented by a document which deals with the same as the claimed invention. It is, however, evident that neither D2 nor D8 relate to the problem of reducing the microgel content in random ethylene copolymers. Thus, in the absence of such a document, the starting point for evaluating inventive step should, hence, be searched for in a document relating to a similar technical problem, or at least to the same or a closely related technical field as the patent in suit (cf. T 989/93 of 16 April 1997, not published in OJ EPO; Reasons, point 12).

6.10 In this connection, while D2 relates to random copolymers of ethylene with unsaturated carboxylic acid and use thereof in extrusion coating, D8 is indeed directed to the manufacture of nonrandom ethylene copolymers, and Comparative Example 6 thereof represents an isolated illustration of what should not

be done in order to obtain nonrandom ethylene copolymers.

- 6.11 Thus, the Board comes to the conclusion, that it is document D2 which can be regarded as meeting the requirements set out in decision T 989/93 to be used as a starting point for the assessment of inventive step.
- 6.12 Starting from D2, the technical problem may be seen in the provision of a process allowing the manufacture of random copolymers of ethylene having a reduced gel content, good extrusion coating properties, good heat seal strength, and good hot tack strength.
- 6.13 The solution proposed according to Claim 1 of the patent in suit is to carry out the copolymerization of ethylene with a comonomer selected from acrylates, methacrylates, vinyl esters and olefinically unsaturated carboxylic acids in a stirred autoclave reactor not only in continuous single phase operation but in addition under temperature and pressure conditions such that the MWD boundary is reached or surpassed.
- 6.14 In view of the comparison between Example 6 (below MWD boundary) and Examples 7, 9, and 10, and of the comparison between Example 12 (below MWD boundary) and Examples 13 and 14 which show an improvement in gel content, in hot tack strength and heat seal strength when working above the MWD boundary, it is credible to the Board that the technical problem is effectively solved by the claimed measures.

7. *Inventive step*

7.1 It remains to be decided whether the proposed solution was obvious in view of the prior art relied on by the Appellant.

7.2 As indicated above in paragraph 6.9 document D2 is not concerned with the reduction of microgels in the random copolymers of ethylene with acrylic, methacrylic or crotonic acid. At least for this reason, document D2, itself, cannot provide a hint to the solution proposed in the patent in suit.

7.3 Nevertheless, when challenging the presence of inventive step, the Appellant relied on a combination of document D2 with document D20. In that respect, it submitted at the oral proceedings before the Board graphs obtained using the data disclosed in the Examples of the patent in suit and showing, in its view, a linear decrease of the amount of microgels with the increase of the polymerization pressure above the conditions at the boundary between the two-phase and the one-phase regions. On that basis, it argued that the decrease in the content of microgels was only linked with the increase of the pressure at which the polymerization was carried out, but that there was no specific effect at or over the MWD boundary. Consequently, the Appellant considered that it would have been obvious to solve the technical problem of reducing the amount of microgels by increasing the synthesis conditions well above the conditions required for a one-phase polymerization, since D20 (page 431, lines 32 to 43), in its view, taught that microgel formation could be avoided if there were no temperature

and pressure drops in the two phase region, i.e. to work above the conditions at the boundary between the two-phase and the one-phase regions.

- 7.4 In that respect the Board firstly observes that the passage of document D20 relied on by the Appellant relates to the homopolymerization of ethylene in tubular reactors (cf. D20, page 430; paragraph 5.3), while the claimed process is directed to the copolymerization of ethylene in stirred autoclave, so that it is more than questionable as to whether the person skilled would have combined the teaching of D2 relating to the manufacture of ethylene copolymers in autoclave reactors with this passage of D20.
- 7.5 Secondly, in the Board's view, even if the skilled person would have considered the teaching of D20 relied on by the Appellant as applicable to the copolymerization of ethylene in a stirred autoclave, he would have nevertheless refrained from working well above the conditions at the boundary between the two-phase and the one-phase regions. This is because he would have expected that an increase of temperature would have led to a broadening of the MWD, and hence, according to D20 (page 431, lines 11 to 13) to gel formation.
- 7.6 Moreover, it is, in any case, evident that D20 is totally silent on the influence on an increase of the synthesis conditions on the hot tack strength and heat seal strength of random ethylene copolymers, and the Board notes that the Appellant has conceded that it could not provide documents making a link between the

reduction of microgels in random ethylene copolymers and these specific properties.

7.7 Consequently, the Board can only come to the conclusion that the combination of D2 with D20 cannot render obvious the solution proposed in the patent in suit.

7.8 Documents D8 and D4 (which is the European patent application corresponding to D8) refer to nonrandom copolymers ethylene with unsaturated carboxylic acids, and document D9 is not concerned with the copolymerization of ethylene. Documents D3, D5, and D6 which relate to copolymers of ethylene copolymers with unsaturated carboxylic acid, and D7 which deals with copolymers of ethylene with vinyl acetate, are not concerned with the problem of reducing microgel formation in these copolymers. Consequently, none of these documents would offer to the skilled person a hint to the solution of the technical problem.

7.9 Thus, in view of the above, the subject-matter of Claim 1, and by the same token that of Claims 2 to 8 do not arise in an obvious manner from the cited prior art.

Order

For these reasons it is decided that:

1. The appeal of Opponent I is rejected as inadmissible.
2. The appeal of Opponent II is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young