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**Datasheet for the decision
of 20 January 2010**

Case Number: T 1387/06 - 3.3.03

Application Number: 95650033.4

Publication Number: 0705852

IPC: C08F 220/04

Language of the proceedings: EN

Title of invention:

High performance alkali - swellable rheological additives for aqueous systems

Patentee:

RHEOX INTERNATIONAL, INC.

Opponent:

Coatex S.A.

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 100a

Relevant legal provisions (EPC 1973):

-

Keyword:

"Novelty (yes)"

"Inventive step (yes) - ex post facto analysis"

Decisions cited:

T 0167/84, T 0254/86, T 0656/90, T 0928/93, T 1029/96,
T 1083/01, T 0041/02

Catchword:

-



Case Number: T 1387/06 - 3.3.03

DECISION
of the Technical Board of Appeal 3.3.03
of 20 January 2010

Appellant:
(Opponent)

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(Patent Proprietor)

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Decision under appeal:

Interlocutory decision of the Opposition
Division of the European Patent Office dated
21 June 2006 and posted 4 July 2006 concerning
maintenance of European patent No. 0705852 in
amended form.

Composition of the Board:

Chairman: R. Young
Members: A. Däweritz
H. Preglau

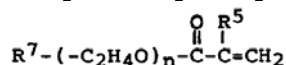
Summary of Facts and Submissions

I. European patent No. 0 705 852 had been granted in respect of European patent application No. 95 650 033.4, filed on 15 September 1995 and claiming the priority of 29 September 1994 of an earlier application in the USA (315000) and had subsequently been opposed. In an interlocutory decision announced by the Opposition Division at the end of oral proceedings on 23 July 2001, the patent had, on the basis of amended Claims 1 to 11, submitted at the oral proceedings, been found to comply with the provisions of the EPC 1973. This decision was appealed by both the Patent Proprietor and the Opponent. In decision T 1083/01 of 23 May 2005 terminating that appeal case, the Board set aside the above previous interlocutory decision and remitted the case to the Opposition Division for further prosecution on the basis of the set of Claims 1 to 11 submitted by the Patent Proprietor with its Statement of Grounds of Appeal filed on 7 December 2001 in the form of amended copies from the patent as granted. Claims 1, 7, 9 and 10 of this set of claims read as follows:

"1. A composition of matter useful as a rheological additive for aqueous compositions comprising the reaction product of

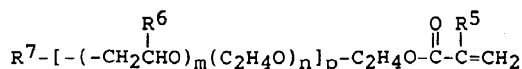
- (a) 15 to 80 percent by weight of one or more C₃-C₈ α,β-ethylenically unsaturated carboxylic acid monomers;
- (b) at least 15 percent by weight of one or more copolymerizable non-ionic vinyl C₂-C₁₂ α, β-ethylenically unsaturated monomers; and
- (c) 0.5 to 25 percent by weight of one or more hydrophobic surfactant monomers selected among non-ionic polyalkoxylated vinyl monomers selected from the group consisting of:

1) poly(ethyleneoxy)ethyl acrylates of the formula:



where R⁵ is H or CH₃, R⁷ is a compound defined below, n is 6-50; and

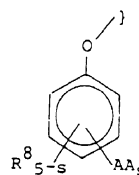
2) poly(alkyleneoxy)ethyl acrylates of the formula:



where R^5 is H or CH_3 , R^6 is C_1 - C_4 alkyl, R^7 is a compound defined below, n is 6-50 and m is 1-40 and $p = 1$ to 10;

wherein

the R^7 compound is of the formula:



wherein:

R^8 is a radical bonded to the aromatic ring selected from the group consisting of hydrogen, alkyl, aryl, aralkyl, OR^6 , halo, cyano, $COOH$, $COOR^9$, $COONH_2$ and $OCOR^9$, and where R^9 is selected from the group consisting of alkyl groups, saturated or unsaturated, having 1 to 22 carbon atoms, aryl and aralkyl,

AA represents an aralkyl group of the type $[(-CR^{10}R^{11})\emptyset]$ and s is an integer from 1 to 3,

R^{10} and R^{11} for each methine carbon of the aralkyl groups are independently selected from the group consisting of H, C_1 - C_{12} linear or branched alkyl, aralkyl and aryl moieties, x is an integer from 1 to 12, and

\emptyset represents an aryl moiety."

- "7. A process for preparing a composition according to any one of claims 1 to 6 comprising polymerizing the monomers (a), (b) and (c), and optionally, a macromonomer."
- "9. A thickened aqueous composition comprising a latex system containing latex, dispersible material and an effective rheological amount of the composition of any one of claims 1 to 6."
- "10. A process of making a thickened aqueous composition which comprises:
- 1) blending with an aqueous composition a polymer composition according to any one of claims 1 to 6, and
 - 2) adjusting the pH of said blend within a range of 7 to 12 as necessary to solubilise the polymer composition therein and, by doing so, to thicken the aqueous composition."

The further dependent claims 2 to 6, 8 and 11 were appendant to preceding claims.

In this decision, references to passages in the patent in suit as granted will be given underlined in squared brackets, those to passages in the application as filed will be shown in underlined italics, eg [0001], or page 1, line 1, respectively. "EPC" refers to the revised text of the EPC 2000, the previous version is identified as "EPC 1973". "EO" is used to refer to

oxyethylene units and ethylene oxide, respectively.
Quoted passages remained unchanged/uncorrected.

II. On 1 July 2005, the Opposition Division continued the opposition proceedings by issuing a summons to oral proceedings in order to deal, according to the order in T 1083/01, with the issues of novelty and inventive step.

At the end of the oral proceedings, held on 21 June 2006, a new interlocutory decision was announced and issued in writing on 4 July 2006 on the basis of the above wording of the claims (section I, above, which had been refiled in identical form at the hearing), and of the description which had been adapted to these claims. In the decision, the Opposition Division held that *"Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the Convention"*.

III. In the interlocutory decision, reference was made, in particular, to test results submitted by the Opponent with its letter of 21 April 2006 (*"Appendix F"*), and to the following documents (out of a list of eighteen documents initially cited by the Opponent):

D1: FR-A-2 693 203,	D5: US-A-4 507 426,
D2: US-A-4 384 096,	D6: EP-B-0 350 414 and
D3: US-A-5 292 828,	D7: US-A-5 082 591.
D4: EP-A-0 349 383,	

(1) Specifically, the Opposition Division accepted neither the Opponent's novelty objections on the basis of either D1 or D6 (decision: No.II.2 of the reasons; minutes of the above hearing: page 1, line 5 to page 2, line 3), nor its objection of lack of inventive step, which had been based on D6 as closest prior art,

because it related to the same technical field, in combination with D1, D3, D4 and/or D7 (minutes: page 2, line 14 to page 3, line 7 from below). By contrast, in its letter of 21 April 2006 (item VI, pages 7/12 to 11/12), the Opponent had argued that the subject-matter of the opposed claims was obvious in view of

*"D1 or D6 alone, or D1 + D6
D2 alone or D2 combined with D6, and D4 or D7
D6 combined with D4 and/or D7
D2 combined with D3 and D4 or D7
(In view if necessary of the precious teaching of D5)
Or either of D1, D2, D3, D5, and/or D6 in combination with D4
and/or D7
- more specifically over D2 (or D5) and D4 and/or D7
- more specifically over D2 (or D5) and D3, and D4 and/or D7
- more specifically over D2 (or D5) and D6, and D4 and/or D7",*

(cf. also the Notice of Opposition, passage bridging page 15/16, fourth last line to page 16/16, line 3).

(2) More particularly, the novelty objection raised by the Opponent on the basis of D1 was rejected, because the entirety of the features characterising the hydrophobic group R⁷ had not been disclosed directly and unambiguously in D1, as became evident from its claim 1 and its page 5, lines 35 to 38.

Nor was the objection of lack of novelty vis-à-vis D6 accepted, because the reference to page 3, lines 19/20 of D6 allegedly disclosing two equivalent thickening agents (ie polyurethane and acrylic compounds, respectively) was to be read in close conjunction with the preceding passage concerning prior art problems and possible solutions thereof. However, this information did not, according to the decision, concern the general inventive concept of D6, which had been the provision of improved thickening agents comprising a urethane linkage. Moreover, the reference to "acrylic" thickening agents was "rather unspecific due to lack of disclosure of structural features" and by no means anticipated the acrylic copolymers defined in the amended Claim 1.

Moreover, it was well-known that urethane and ester linkages were structurally different and had different chemical reactivity. Therefore, the skilled person would never consider these different linkages as representing equivalent concepts (dec. {abbreviation of "decision"}: pages 2/3, No. II.2 of the reasons).

(3) With regard to inventive step and in view of [pages 3 and 4] indicating that "*an object of the invention was to provide a highly effective polymeric rheological additive for aqueous compositions, particularly aqueous paints and coatings. Another object was to provide an additive that could be readily dispersed into the system to be thickened, which was easily handled and could be readily incorporated. A further object was to provide an additive which could be easily made using available chemical materials and current process technology.*" (dec.: the paragraph bridging pages 3 and 4), the Opposition Division dealt with the cited documents, in a first step, separately.

(4) Thus, D1 referred, according to the decision, to a copolymer comprising, besides monomers (a) and (b), a special "*ethylenically unsaturated oxyalkylated monomer terminated by a hydrophobic fatty chain having at least 26 carbon atoms such as alkyl, alkylaryl aralkyl or aryl groups (cf. general formula on page 5)*". However, it neither suggested to incorporate a surfactant monomer having a hydrophobic aralkyl substituted phenol group, nor gave a hint to a specific problem which could be solved by this specific monomer. Rather D1 taught away from this specific hydrophobic group, since it referred to a hydrophobic group R', preferably a linear or branched alkyl group ≥ 28 carbon atoms, as confirmed by all its examples (wherein all R' groups had been C_{28...36} alkyls, (= C₂₈ to C₃₆ alkyls; dec.: page 5, lines 4 to 18).

(5) The copolymer of D2 (as acknowledged on [page 3, lines 12 to 15]) contained at least one non-ionic vinyl surfactant ester component having an end group R" being C_{8...20} alkyl or C_{8...16} alkyl phenyl and exemplified the type of thickening compositions that had been found to be unsatisfactory in D1. There was no suggestion in D2 to replace R" in its component (c) by an aralkyl substituted phenol group R⁷, nor was there any hint to a specific problem which could be solved with this unique comonomer (decision: page 5, lines 19 to 26).

(6) Document D6 disclosed associative thickening copolymers including a surfactant monomer having at least one urethane-linkage resulting from the reaction of an unsaturated isocyanate with a OH-functional surfactant compound. Although a large number of hydrophobic substituents were mentioned (including distyryl phenol/"DSP" in Table I), the document provided no information showing any advantage when choosing this specific substituent. Nor was there any hint that the mandatory urethane linkage could be replaced by an ester linkage or that "*phenolic*" end groups should be used (dec.: page 6, line 27 to page 7, line 15).

(7) Furthermore, neither D3 nor D5 suggested a surfactant monomer having an aralkyl substituted phenol group or referred to an associated problem that could be solved with such surfactants. Although D3 taught water-soluble copolymers containing ≥ 1 hydrophobic group and recommended several structural features such as steric factors, placement of the hydrophobic group and molecular weight, it did not hint to an aralkyl substituted phenol end group as defined by R⁷, let alone to a specific combination of a preferred group of hydrophobic substituents with a given polymeric backbone. The more specific teaching in the examples

rather showed *"a clear preference for long chain alkyl groups (eg nonyl group)"*. *"In summary, D3 cannot provide any information as to a possible solution to the problem of the opposed patent"*, except by hindsight analysis (dec.: page 5, line 27 to page 6, line 12).

(8) On page 2, lines 8/9 of D4, reference was made to the (co)polymerisation of vinyl monomer(s) **"in the presence"** of the emulsifier", ie a "polyoxyethylenated tri(1-phenylethyl)phenols" emulsifier. Based on this statement, the Opposition Division rejected the Opponent's argument, that *"the di- or triphenyl phenol surfactant is aimed at being polymer-ised with at least a non-ionic vinyl monomer"*, because of lack of a suitable reactive group. This finding was also held valid for D7. Neither document would have been considered by the expert when looking for possible improvements of thickeners prepared from the monomers (a), (b) and (c) as defined in the challenged claims (dec.: page 6, lines 13 to 26).

(9) The further documents were deemed far remote from the claimed subject-matter (dec.: page 8, lines 3 to 6).

(10) According to page 8, lines 7 to 12 of the decision, *"Admittedly, the problem to be solved and the principle of the patent in suit which is the incorporation of a surfactant into alkali-swellable-type polymers to provide enhanced thickening was already known at the priority date ie the problem is not new (see page 3 of the patent). However, the opposed patent provides an alternative solution to a known problem and thus involves an inventive step (...)"*.

(11) On the other hand, the Opposition Division had referred in the paragraph bridging pages 3 and 4 of the decision to a demanding combination of objects to be achieved (section III(3), above).

These objects were, according to the decision, achieved with the composition of Claim 1 comprising the reaction product (ie copolymer) of monomer components (a), (b) and (c), whereby component (c) was required to have a specific structure residing in the combination of a (meth)-acrylate moiety and a specific hydrophobic phenol end group R⁷ linked together by a polyoxyalkylene chain. The incorporation of component (c) led to improved performance relative to conventional thickeners on an equal weight basis as demonstrated in [Examples 1 to 3] (as shown by increased Stormer and ICI viscosity efficiency). Thus, the same degree of thickening could be achieved with less of the claimed thickeners (dec.: page 4, middle paragraph).

This effect was explained with the unique spatial arrangement of the hydrophobe R⁷ group linked to the backbone, but separated therefrom by "*a large number*" of EO units. This allowed the resulting polymer to thicken not only by an alkali-swellaible mechanism, but also by an "*associative mechanism*". Due to the latter effect, the claimed thickeners displayed increased efficiency in latex paint system coupled with improved flow and levelling properties.

(12) Moreover, the Opposition Division held that the test results in Appendix F (cf. section III, above) also provided support for inventive step, because it showed that, in comparison with the urethane-linked monomer (as in D6), half of the amount of the special hydrophobic monomer (c) as defined in the patent in suit led to comparable viscosities (cf. page 3 and the last page "*TABLE UR ESTER LINK*" of Appendix F), and that this improvement had been suggested nowhere in the prior art (dec.: page 7, last paragraph).

Additionally, the decision referred in this context to decision T 41/02 of 19 January 2006 (not published in OJ EPO; parts of which had been referred to by the Opponent as Appendices C and D, respectively), in which the Board had found that a document cited in that case (= D7) neither related to thickening agents nor contained any teaching about the potential influence of DSP or tristyril phenol/"TSP" groups upon rheological effects, let alone related to shear thinning rheology at a relatively low pH. Moreover, a skilled person, reading another document cited therein (= D6), had had no incentive whatsoever to choose from the document a surfactant monomer containing hydrophobic styryl groups in the expectation of improving pH response and rheological effects of a copolymer comprising such a monomer, let alone to abandon an essential feature, namely the urethane group, from the hydrophobic monomer disclosed in that cited document (= D6).

(13) According to the decision, none of the documents cited in the present case, taken individually or in any combination, provided a motivation to prepare the composition of the contested patent. In a worst case scenario, the cited documents disclosed at most certain structurally related surfactants (dec.: page 4, line 16 to page 5, line 3). Any combination, in particular of D6 and D4 (or D7), as referred to by the Opponent, lacked the necessary link between their teachings ("*as shown above*", cf. sections III(8) and III(12), above). When starting from D6, the skilled person would not have been prompted by D3 or any other document to pick out the necessary, very specific pieces of information from these documents in order to arrive at the claimed subject-matter. This was held valid, even if the problem was seen only in the provision of an

alternative solution to a known problem (as mentioned in section III(10), above).

(14) The Opposition Division concluded that "*any attempt to combine two or more documents in order to arrive at the challenged subject-matter represent an **ex post facto analysis** which is not a suitable means to prove a lack of inventive step (cf. Guidelines C-IV, 9.10.2).*" (dec.: page 8, lines 13 to 15).

Consequently, the patent in suit as amended was held to comply with the requirements of the EPC 1973.

IV. On 1 September 2006, a Notice of Appeal was received from the Opponent with simultaneous payment of the appeal fee. The Statement of Grounds of Appeal (SGA) was received on 3 November 2006.

(1) In its SGA, the Appellant reiterated, to a large extent, its previous arguments concerning the objection of lack of novelty with reference to D1 and D6.

(2) In connection with D1, it put emphasis on what had, in its opinion, been "*made available to the public*" and on the assertions that "*a skilled man would have understood from D1 that nothing could prevent him to select any compound he wished in both families, namely the radical R7 of the opposed patent.*" and that, as shown in "*Appendix K*", a "*marketing leaflet from Rhodia*", "*under the wording « alkyl aryle » the skilled man had a clear recognition of groups like the fatty chains nonyl phenol or the polystyryl phenol groups. This confirms that D1 does disclose groups such as polystyrylphenols, ...*" (SGA: page 7/29, lines 3/4; page 8/29, lines 8 to 10 and page 9/29, lines 9 to 14).

(3) With regard to D6, the Appellant argued that the document addressed the problem of the opposed patent (rheological compromise at high and low shear) and disclosed terminal hydrophobic groups which were DSP or

TSP. The fact that the document "uses an urethane link and not an ester link" would be unimportant, because, as shown in the "Table UR ESTER LINK" (cf. section III(12), above), "the results of the rheological profiles are remarkably identical or similar. There is anyway absolutely nothing of a nature to cause a prejudice against EITHER an UR link OR an ester link." Furthermore, whilst "The patentee objected to that Table that the amount of hydrophobic monomer was double or so of theirs ... We can only reiterate here our saying during the oral proceedings that the proportion of monomer c) was UNimportant: what IS important is the global effect of the whole product and in that respect the produced Table is entirely pertinent." and "Apparently, the patentee just relied on the psychological impact of presenting something being « half the amount » with no demonstration whatsoever of what the ACTUAL impact was in terms of technology and industrial applications ..." In order to support its view, the Appellant submitted a further "APPENDIX J", which was to show that equal amounts of monomer (c) (5%) resulted in rheological profiles being quite equivalent, irrespective of whether it was based on a urethane or an ester linkage (SGA: page 9/29, last five lines, page 10/29, lines 1 to 10 and 18 to 30 and page 11/29, lines 1 to 7).

Consequently, with regard to "The only difference presented by the patentee and the Division regarding the novelty of the opposed patent over D6 is, D6 relates to compounds comprising an urethane linkage, instead of an ester linkage.", the Appellant stated that "We therefore sustain that for a skilled man both linkages are pure technical equivalents, and this is pure common knowledge." (SGA: page 11/29, lines 12 to 10 from below and page 13/29, lines 8 and 9).

(4) Before presenting its arguments concerning inventive step with regard to individual documents, the

Appellant referred under the heading "Could/would discussion" (starting on its page 15/29) to an alleged shift which had suddenly taken place "around the year 1988" from "linear, long chain, fatty hydrophobic groups" towards "bulky groups, namely mono-, di- and tristyrphenol groups, see D4, D6, D7, D3 (col.11 « styryl »)". This could allegedly be derived from a diagram filed with the SGA as "APPENDIX B" (listing many of the initially cited documents in relation to a time abscissa "PUBLICATION DATES" covering the years '79 to '94). This would have prompted the person skilled in the art to copolymerise surfactant monomers with mono-, di- and tristyrphenol end groups with monomers (a) and (b).

(5) Subsequently, the Appellant referred to each of D1 to D7, in particular in order to show that the hydrophobic end groups, the oxyalkylene groups or the ethylenically unsaturated groups (where present) in those documents were the same as or were equivalent to those groups in monomer (c) as defined in the operative claims. Essentially, the Appellant concluded from its arguments to inventive step that the claimed subject-matter "lacks inventive step over the general common knowledge (the general structure of the polymer chain) and D4 OR D7" and also over combinations of documents as mentioned in section III(1), above (SGA: page 27/29, third last line to page 28/29, line 11).

(6) Although "the experimentation in D1 only covers the fatty alkyl chains", D1 (published on 7 January 1994) was, in the Appellant's view, "in line with the shift", because "aryl, arylalkyl and alkylaryl definitions (with $C > 26$ pref. > 30) encompass the mono- di- and tri styryl-phenols". According to the Appellant, the filing of D1 "had deliberately been delayed so that D6 ... which expressly teaches and exemplifies the mono, di and triSP, ..., be filed

when the new trend appeared" in order "to be the *FIRST* document of the prior art to disclose and teach the mono- di and tristyrilphenol groups" (SGA: page 19/29, last paragraph and page 20/29, paragraphs 1 to 4).

(7) Document D2 addressed, according to the Appellant, "very specifically the specific concern of the opposed patent." Moreover, its examples offered a better compromise than the opposed patent in [Table III] as far as the levelling and sag properties were concerned. This would be an important factor against the inventive step, which had, however, been overlooked by the decision under appeal. Furthermore, the composition of the paint formulation used in [Table III] had not been disclosed.

(8) With reference to decision T 41/02 (above), the Appellant argued that D6 disclosed an associative polymer having an EO chain terminated by mono-, di- or tristyril phenol groups. According to the decision under appeal, the only difference between D6 and the patent in suit resided in the presence of a urethane link instead of an ester link, which links could, however, easily and routinely be created and were chemically or technically equivalent (cf. section IV(3), above), because their sole function was to link the EO-hydrophobic terminal chain to the acrylic part of the thickener (SGA: page 24/29, lines 3 to 10 of item IV).

(9) Both D4 and D7 disclosed, according to the Appellant, poly-EO-compounds terminated by DSP or TSP groups. Moreover, "*SURFACTANT* molecules are of interest, like those disclosed in D4 and D7, provided they can be used as a « reactant », which is the case in D4 and D7." They would, therefore, be highly relevant. Moreover, D3 and D5 would show that the HLB of the surfactant was an

important factor. D3 would further show the criticality of the steric factor, and, according to D5, it was critical that a surfactant was bound as a hydrophobe group in an associative polymer. Likewise, this was also important for D2, D4, D6 and D7 (SGA: page 26/29, 2nd half). *"The skilled man cannot miss that the surfactant molecules of D4 and/or D7 can be used as « reactant surfactants » at the end of the usual carboxylic chain: they have the proper terminal, reactant group."* (SGA: page 27/29, lines 5 to 7). Therefore, these documents would specially qualify as prior art because of the teachings in D2 and D5 confirming the need for a surfactant as hydrophobe group in an associative polymer.

V. With its rejoinder dated 30 March 2007, the Respondent filed retyped copies of the above Main Request (sections I and II, above), and two new Auxiliary Requests. Each of these requests was accompanied by copies of [pages 4 to 6], each adapted in handwriting to the wording of the respective claims. As neither Auxiliary Request played a role in these appeal proceedings, there is no need here to consider them in more detail.

(1) Furthermore, the Respondent filed new experimental reports "D20" and "D21" containing further experimental data comparing the thickening effect of copolymers according to the claims with conventional commercial thickening products (Rheolate 1 and Acrysol[®] TT-935) and disputed the Appellant's arguments concerning (i) the alleged equivalence of a urethane and an ester link and (ii) the creation of these links (*"... the link can be created easily and routinely ..."*; sections IV(3) and IV(8), above). Rather, the Respondent referred to the more complicated sequence of reaction steps in the preparation of such a urethane link and the criticality

of the reaction conditions in these reaction steps (rej. {abbreviation of "rejoinder"}: pages 10 to 12).

(2) In fact, the Respondent disputed all the arguments of the Appellant concerning the questions of novelty and inventive step. On pages 2 and 3 (item II) of the rejoinder, the Respondent commented on a number of different arguments of the Appellant and compared them with the actual teaching in the patent in suit.

(3) In this connection, the Respondent referred (i) to the passage on [page 2, line 53] to [page 4, line 4] dealing with the objects to be achieved in the patent in suit and (ii) to the effects achieved with the claimed composition due to the composition of its copolymer, as addressed on [page 7, lines 24 to 34] and on [page 4, lines 41 to 43]. Thus, the technical problem was, according to the Respondent, to find a highly effective copolymer thickener that could be easily handled and could be readily dispersed in the system to be thickened. The solution found was based on an associative thickening copolymer comprising in certain proportions three monomer components, all contributing to the solution, ie both the monomer components (a) and (b) in combination with the surfactant monomer component (c) having a hydrophilic (ie polyoxyalkylene) portion and a hydrophobic aralkyl substituted phenol end group (ie R⁷). The associative mechanism of the polymer contributed, in combination with the already effective alkali-swellable mechanism, to an increased efficiency in a stable latex paint system coupled with improved flow and levelling properties. Effects of the associative mechanism of the copolymer as addressed on [page 7, lines 24 to 34] were (i) the generally assumed formation of a network-like structure with the latex particles, which broke down

upon application of shear and resulted in "*shear thinning*", and (ii) the diffusion-controlled recovery of the network-like structure upon the removal of the shear force, which resulted in a viscosity increase at a relatively controlled rate.

(4) In respect to D1, the Respondent pointed out that its disclosure did not encompass the definition of R^7 , but defined the groups R' of its thickening agent as representing "*a hydrophobic group with a fatty chain, such as alkyl, alkylaryl, aralkyl, or aryl group, linear or branched, and having at least 26 C atoms, preferably at least 30 C atoms.*" (D1: page 5, lines 35 to 38). Since, by contrast, R^7 according to Claim 1 had to include an *aralkyl aryl group*, "*D1 clearly fails to directly and unambiguously disclose the claimed invention.*" (rej.: page 4, lines 20 to 23 and its last line to page 5, line 6). Appendix K (section IV(2), above) should not be admitted into the proceedings, because neither was its publication date clear, nor could such a document represent common general knowledge.

(5) With regard to D6, the Respondent argued that one mandatory feature of its thickener was the presence of a urethane group in the molecule. It furthermore, pointed out that its hydrophobic end group R_1 could be selected from a large number of different groups including hydrocarbon and amine chemical structures, but preferably R_1 was a $C_{12...30}$ hydrocarbon chain (rej.: page 6, last paragraph). Moreover, in table I, only eight compounds within a list of 88 surfactant monomers had DSP end groups, and in Table II, 42 copolymers were listed, but only one of them (copolymer AG) was based on a monomer with a DSP end group. Furthermore, the source of ethylenic unsaturation in this surfactant monomer used for copolymer AG of D6 had been allyl

alcohol, whereas, in the patent in suit, it was provided by an acrylate or methacrylate.

The comparative tests in Examples 3 to 8 of D6 compared associative thickening copolymers of its invention with prior art thickeners (all of which "*comprise an acrylic ester surfactant monomer rather than a urethane surfactant monomer.*") in paint compositions, wherein all of its own thickeners had lauryl (C₁₂) end groups in the surfactant monomer units. None of the thickeners tested included a surfactant monomer having a DSP or TSP end group. On page 3, lines 45 to 48 of D6, the beneficial effect of the urethane groups on the rheological behaviour of water-based paints was mentioned, which taught further away from the present case. Moreover, on page 4, lines 33 to 39 of D6, the importance of the urethane function in the structure of the surfactant monomer units was stressed (rej.: item III.1.2, page 6, last paragraph; page 7, paragraphs 1, 2, 5 and 6).

(6) With regard to the Table on the last page of Appendix F (cf. sections III and III(12), above) and the results shown therein, the Respondent argued that two polymer compositions differed from each other in their respective amounts of ethyl acrylate and of the surfactant monomers (c), whereby the ester monomer concentration in the one copolymer had only been half the concentration of the urethane monomer in the comparison. Thus, different entities had been compared, which was also true for the additional experiments submitted in Appendix J (section IV(3), above).

Furthermore, the Respondent referred to the [examples] which showed the dependency of the efficiency of the thickener on its total composition, not only on the surfactant monomer (cf. section V(3), above).

(7) With regard to the alleged lack of inventive step vis-à-vis the cited prior art, the Respondent supported the decision under appeal, in that it did not see any incentive to modify the teaching of any one of D1, D2, or D6 on the basis of the teaching of the other documents of this group or of D4 or D7. Any argument asserting a trend towards the claimed subject-matter could only be based on hindsight analysis. Nor did D3 provide any teaching that DSP would make a good hydrophobe or of any direction for use of urethanes vs. esters. In relation to D5, it should be noted that it required in addition to the emulsion polymer a urethane thickener. As regards the asserted better compromise between sagging and levelling in the examples of D2, the Respondent pointed out that *"One skilled in the art knows that sag and leveling are opposing properties; that is, the higher the sag value, the poorer the leveling and vice versa."* (rej.: page 13, paragraph 3).

- VI. On 2 October 2009, the Board summoned the parties to oral proceedings to be held on 20 January 2010.
- VII. In reply to the summons, the Appellant informed the Board with its letter dated 18 December 2009, that it would not attend the oral proceedings.
- VIII. In a letter dated 18 December 2009, the Respondent submitted a Third Auxiliary Request comprising 9 claims and [pages 4 to 6] adapted thereto. In a still further letter dated 15 January 2010, the Respondent replaced the above First Auxiliary Request (section V, above) by a new version containing 9 claims and [pages 4 to 7] adapted thereto and submitted three further documents. None of the Auxiliary Requests and further documents, played, however, a role in these proceedings. Therefore, they need not be considered further in this decision.

Since the parties had duly been summoned, the Board decided to continue the proceedings in the absence of the Appellant (sections VI and VII, above; Rules 115(1) and 115(2) EPC).

IX. At the oral proceedings, held on 20 January 2010, the Respondent was given the floor to present its case.

(1) With regard to novelty, the Respondent reiterated its previous arguments (section V(4) and V(5), above). Thus, it put again emphasis on the fact that D1 did not disclose copolymers containing moieties derived from a surfactant monomer having a hydrophobic aralkyl aryl end group according to the definition of R⁷, as opposed to those having a fatty chain as referred to in D1.

Appendix K, to which reference had been made by the Appellant in order to support its arguments concerning D1, did not relate, in the Respondent's opinion, to common general knowledge and could not, therefore, expand the disclosure of D1 to the meaning of R⁷.

(2) Document D6 described thickening copolymers containing at least one linking urethane group. Whilst mentioning two families of associative thickeners, one of *urethane* thickeners, the other of *acrylic* thickeners, the document pointed out that these acrylic compounds had clear disadvantages in comparison with the urethane compounds. Thus, they required large quantities to be used (which the formulator desired to see decreased) in order to achieve an acceptable rheological profile or they did not manage to control simultaneously the viscosities under high and low shear. According to D6, these disadvantages were remedied by the use of the *urethane* containing copolymers (D6, page 3, line 54 to page 4, line 10). Therefore, there was a clear difference between those two types of copolymers.

(3) As regards inventive step, the Respondent referred to the objects underlying the claimed subject-matter as described in the passage of from [page 3, line 53] to [page 4, line 4]. The aim was to provide a highly effective polymeric rheological additive for aqueous compositions, particularly aqueous paint and coatings, which could easily be made and could readily be incorporated into the aqueous compositions.

(4) With reference to the preparation of the urethane surfactant monomer as disclosed in D6 and of a monomer according to component c) of the patent in suit, the Respondent referred to the table on pages 10 to 12 of the rejoinder, which showed that the surfactant monomers (c) used according to the patent in suit could be prepared in a much simpler way than those used in D6 and, thus, disproved the Appellant's allegation of the equivalence of these compounds.

(5) The desired rheological properties of the claimed copolymer were not only the property of shear thinning resulting in good flow properties, but also a viscosity increase after removal of the shear force providing good levelling properties and good sag resistance. These properties were exemplified by Stormer and ICI viscosity values in [Examples 1 to 3] in comparison to those viscosities obtained by addition of conventional thickeners. These results were not, however, only caused by the presence of the moieties derived from monomer (c), but they were rather the result of the combination of units (a), (b) and (c) as shown in the table on page 8 of the rejoinder, which had been collected from the [examples].

Whilst pointing out that the exact composition of a competitor's product Acrysol[®] TT935 as used for

comparison was not known to him, the technical expert of the Respondent stated that the product was a viscosity modifier apparently on the basis of an alkali-swellaable acrylic emulsion polymer containing an oxyalkylene chain and a hydrophobic group having a straight-chain alkyl shorter than the product of D1.

(6) Moreover, the Respondent pointed out that the experiments submitted by the Opponent/Appellant in Appendix F (as referred to in sections III and III(12), above) clearly demonstrated that (contrary to the statements on page 3, lines 54 to 56 of D6) the copolymer containing ester bound poly(oxyalkylene)-TSP groups needed be used in a remarkably lower amount than the comparable urethane copolymer (according to D6) for achieving the same viscosity level. Therefore, this comparison proved, in the Respondent's view, the desired improvement of the viscosity properties and demonstrated that the technical problem with regard to the closest prior art D6 was indeed solved by the claimed subject-matter. The additional results presented by the Appellant in Appendix J (section IV(3), above) were not, according to the Respondent, fair comparisons, since the copolymers compared with one another differed significantly in the concentrations of all three of their components (a) (methacrylic acid), (b) (ethyl acrylate) and (c) (surfactant macromonomer).

(7) Furthermore, the Respondent disputed, on the one hand, with reference to the capability of urethane groups to form hydrogen-bonds, that the ester and the urethane linkages would simply be equivalent linkage groups, and on the other hand, with reference to the fact that D1 was one of the most recently published documents referred to by the Appellant, that there had

been the alleged clear shift to the hydrophilic styryl phenol groups, as alleged by the Appellant.

(8) When the Respondent had terminated its statements, the debate was closed on the Main Request and the state of the requests at this time was again established.

- X. According to the file, the Appellant requested that the decision under appeal be set aside and that the patent in suit be revoked.

The Respondent requested that the appeal be dismissed (Main Request) or, in the alternative, to set aside the decision under appeal and to maintain the patent on the basis of the first Auxiliary Request filed with the letter dated 15 January 2010 (Claims 1 to 9) or the second Auxiliary Request filed with the letter dated 30 March 2007 (Claims 1 to 9) or the third Auxiliary Request filed with the letter dated 18 December 2009 (Claims 1 to 9).

Reasons for the Decision

1. The appeal is admissible.

Main Request

2. Questions concerning the formal requirements of Articles 84, 100(c) or 123(2) EPC have not been raised during the opposition and appeal proceedings with regard to the operative requests. Nor does the Board see any reason for any objections in this respect.

3. *Problem and solution*

- 3.1 The patent in suit relates to "*compositions of matter*" and processes for making such compositions, which are based on copolymers useful as rheological additives for aqueous compositions (*viz.* as associative thickening agents "*for controlling viscosity and rheology of any*

aqueous based composition"). Therefore, the patent aims at compositions which can be easily handled and readily incorporated into the system to be thickened. Moreover, it is expected that they can be easily made using available chemical materials and current process technology and display increased efficiency in a latex paint coupled with improved flow and levelling properties ([page 3, line 53] to [page 4, line 4]; [page 4, lines 33 to 43]; [page 7, lines 27 to 34] and [page 8, lines 47 and 48]).

The copolymers contained in the claimed compositions are composed of certain amounts of one or more ethylenically unsaturated C_{3...8} carboxylic acid monomers (a), of one or more copolymerisable non-ionic vinyl C_{2...12} α,β -ethylenically unsaturated monomers (b) and of one or more hydrophobic surfactant monomers (c).

3.2 It has not been in dispute, that, like the copolymers in the patent in suit, the copolymers described in documents D1, D2, D3, D5 and D6, to which the Appellant had repeatedly referred (sections III(1) and IV(5), above), were derived from essentially three monomer components. Moreover, it was common ground between the parties that the nature of monomer components (a) and (b) could not serve as distinguishing feature between the subject-matter of the patent in suit and the subject-matter of the documents mentioned above.

3.2.1 Ethylenically unsaturated acidic compounds having at least one carboxylic group, the partial esters and anhydrides can be mentioned as examples for the "*acid comonomer(s)*" of component (a).

3.2.2 The monomers of component (b) are ethylenically unsaturated compounds free of acidic groups. Examples for this type of compounds are esters, nitriles and

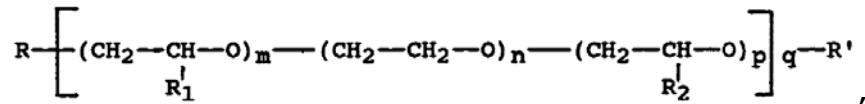
hydrocarbons, like styrenic compounds and dienes. They will be referred to as "non-ionic vinyl comonomers".

3.2.3 Neither monomer played a role in the discussion about novelty and inventive step.

3.2.4 Consequently, the discussion between the parties had focused essentially on the chemical nature of the "surfactant comonomers" of component (c).

3.2.5 In the patent in suit, the compounds of this component are composed of three groups: (i) an ethylenically unsaturated group derived from (meth)acrylic acid, (ii) a hydrophobic terminal group derived from an aralkyl substituted phenol, which will be referred to as R⁷ (as in Claim 1; section I, above) and (iii) a poly(oxy-alkylene) chain linking the two other groups together.

3.3 As regards the comonomer component (c), the copolymer of D1 is derived from at least one "special comonomer" C being an oxyalkylated monomer of the following formula



wherein R is an ethylenic unsaturated group and R' is a hydrophobic fatty chain group.

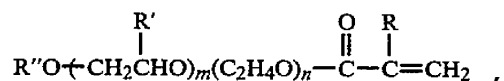
3.3.1 According to Claim 1 and page 5, line 35 to page 6, line 2 of D1, R' denotes a hydrophobic group having a fatty chain, such as the linear or branched alkyl, alkylaryl, aralkyl or aryl groups having ≥26 C atoms, preferably ≥30 C atoms, or, preferably, R' denotes a hydrophobic C₂₈ alkyl group, linear or branched, with a number of alkylene oxide (units) within the range of 10 to 70 (sections III(4), IV(6) and V(4), above).

3.3.2 The problem, which D1 sought to solve, resided in the provision of a copolymer which (i) would increase the thickening of aqueous compositions at low shear

gradients due to the increased thickening ability of the claimed polymer and (ii) would confer excellent stability to aqueous suspensions of organic and mineral materials (*viz.* with regard to sedimentation) without, therefore, notably increasing the viscosities, as was often the case with prior art polymers ("*sans qu'il y ait pour autant d'augmentation notable des viscosités comme c'est souvent le cas des polymères décrits dans l'art antérieur.*"; D1: page 2, lines 20 to 28).

- 3.3.3 In the tests of Examples 1 to 8 of D1, the thickening effects imparted to aqueous compositions by different copolymers in accordance with its claims (indicated in the tables of D1 by "INV." = invention) were compared with those of copolymers outside that scope (indicated in the tables as "A.A." = art antérieur/prior art). In its inventive examples (Tables I to VIII), all groups R' were alkyls with ≥ 28 C atoms, whereas they were alkyls of < 26 C atoms in the comparative tests, with one exception, the nonyl phenyl group in "ESSAI N° 16".
- 3.3.4 In Example 2 of D1 (Table II), the thickening effect of two different copolymers of methacrylic acid, ethyl acrylate and C₃₄ alkyl-poly(EO) methacrylates, respectively, was tested in an aqueous composition (a shampoo) under two different shear conditions measured before and after storage for 48 hours. The compositions remained clear in each of "INV." Tests 18 to 20 and the thickening effect of each of these copolymers was significantly higher (Brookfield_{10/s} > 1000 mPa·s after 48 h) than that of the copolymer of methacrylic acid, ethyl acrylate and nonyl phenoxy-poly(EO) methacrylate ("A.A." Test 16).
- 3.4 Document D2 discloses a copolymer derived, besides the acid comonomer (a) and the non-ionic vinyl comonomer

(b), from a surfactant comonomer "C" of the formula

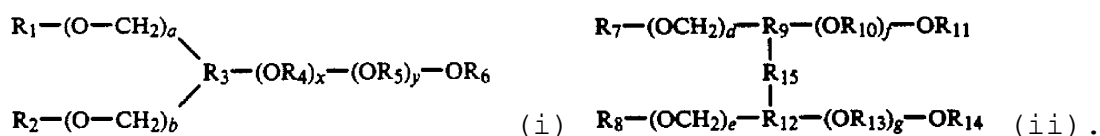


wherein the hydrophobic terminal group R'' is a C_{8...20} alkyl or a C_{8...16} alkyl phenyl (D2: column 2, formula III; column 4, line 29 to column 5, line 9; column 10, lines 25 to 28; column 13, lines 28 to 30; Claims 1, 7, 9 to 11, 20 and 30). More particular mention is made of copolymers containing units of a monomer C derived from one of the following alcohols: dodecylphenoxy-poly(EO) ethanol (column 10, lines 41 and 42); hexadecyl-poly(EO) ethanol (column 10, line 62); nonyl phenoxy-poly(EO) ethanol (Claims 12, 16 and 25; column 9, lines 62 and 63; column 10, lines 29 and 30) or methoxypropoxy-poly-butoxy-poly(EO) ethanol (column 11, lines 3 and 4). This means that these comonomers correspond to those used in the above comparative examples of D1.

The document concerns "*stable liquid polymer emulsions having low viscosity and relatively high solids content under acidic conditions, but becoming very effective polymeric thickeners for many aqueous systems when treated with base*" (D2: column 1, lines 59 to 64). "*One particular concern is controlling the paint rheology to obtain proper flow and leveling with a minimum of dripping and spattering*" (column 1, lines 22 to 24). It was assumed that association of the thickener of D2 with other components of paint formulations tested in the examples led to the achievement of the above goal (column 18, lines 29 to 57).

According to D2, increasing the chain length of the hydrophobic terminal alkoxy or alkyl phenoxy group will increase, at a given poly(EO) content, the efficiency of the resulting polymer as a thickener (column 5, lines 54 to 57 and column 13, lines 27 to 29).

3.5 Document D3 refers to water-soluble polymers which comprise hydrophobic segments, each segment containing at least one hydrophobic group or complex hydrophobic groups in an amount sufficient to provide for enhanced thickening of aqueous solutions containing the polymer (column 1, lines 23 to 31). These compounds are to replace commercial thickeners like hydroxyethyl or methyl celluloses because of deficiencies of these thickeners in respect of their thickening power, as well as in respect of the flow and levelling in the formulations, in which they are used. These water-soluble polymers can be derived from compounds having at least one active hydrogen and being represented by one of the following formulae (i) or (ii):



In these formulae, each of R₁, R₂, R₇ and R₇ can be hydrogen or a substituted or unsubstituted monovalent hydrocarbon (D3: column 9, below formula (i); column 10, below formula (ii)). Terminal groups R₆, R₁₁, R₁₄ may "include, for example, hydrocarbon residues which may contain allylic or vinylic unsaturation, acrylic or methacrylic functionality, styryl or alpha-methylstyryl functionality, and the like, such as the reaction Product between the terminal alcohol (R₆, R₁₁, R₁₄ ... = H) and glycidyl methacrylate, isocyanatoethyl methacrylate, alpha, alpha-dimethyl-misopropenyl benzyl isocyanate (m-TMI), and the like." (D3: column 11, lines 38 to 46; SGA, page 26/29, lines 10 to 8 from below: "« styryl ... ").

However, in Examples 1 to 34 of D3, the above groups having "unsaturation" or "functionality" could apparently correspond only to the copolymerisable (meth)acrylate part of the monomers (c) in the patent in suit. This is

further supported by the explanation of the copolymers of Examples 64 to 86 as being derived from the monomers of Examples 26 to 32 (Tables A, B and F) and by the contents of Tables 1 to 4 of D3, wherein each of R_1 , R_2 , and R' is alkyl or alkylphenyl, and R' is a side group on the oxyalkylene chain corresponding to R_4 or R_5 in its formula (i) (cf. D3, column 9: the formula in Table 4 and formula (i) at line 45).

3.6 In D5, a mixture of a thickening amount of a urethane polymer having at least three hydrophobic groups ("*at least two of which are terminal (external) hydrophobic groups*"; column 2, lines 29 to 31), which are "*linked through hydrophilic (water-soluble) groups*" desirably containing polyether segments, and a syneresis reducing amount of an emulsion polymer having a composition like the polymer of Claim 1 of D2 (section 3.4, above; cf. D5: Claim 1) was found useful as thickening agent for aqueous systems. Moreover, in Example 1 of D5, reference was even made to a copolymer as prepared in Example 2 of D2. The polymers are required readily to solubilise in water, either by self-solubilisation or through interaction with a known solubilising agent (D5: Claim 1, and column 2, lines 27 to 41).

3.7 Document D6 describes thickening agents which modify the rheological characteristics of charged and/or pigmented, white or coloured aqueous compositions by associative action (D6: page 2, lines 3 to 5).

3.7.1 In the background to its subject-matter, reference is made in D6 to acrylic associative thickening agents as belonging to the prior art. These agents were water-soluble in neutral or alkaline medium (D6: page 3, lines 33 to 37), and were formed from copolymers, which had, in general, been prepared, on the one hand, from

ethylenic carboxylic acids or possibly from esters of these acids and/or other monomers and, on the other hand, from at least one particular functional monomer having a lateral chain of polyether groups linked to hydrophobic, hydrocarbon terminal radicals. The particular functional monomer was further explained as being a (meth)acrylate of a surfactant alcohol or the result of the esterification of acrylic acid oligomers with a surfactant alcohol or it could be an ethoxylated ester of crotonic acid or a maleic anhydride hemiester or even a surfactant ether of allyl alcohol (D6: page 3, lines 40 to 44). However, D6 does not provide any further information about the surfactant group/alcohol or the chemical composition of the prior art acrylic associative thickening agents *per se*, as referred to in the "Arrière plan de l'invention" or in any one of the comparative examples of the document.

3.7.2 According to D6 (page 3, line 54 to page 4, line 1), the acrylic associative thickening agents had, however, some severe disadvantages. Thus, they had to be used either in large quantities (contrary to the desires of the formulator of those aqueous compositions mentioned above) or they did not manage to control simultaneously the viscosity under high and low shear.

3.7.3 These disadvantages were to be overcome by means of the subject-matter of D6 relating to an associative thickening copolymer derived from three comonomer components (as to the monomer components (a) and (b) see sections 3.2 to 3.2.2, above). The third monomer component (c) was a surfactant monomer having at least one urethane linkage resulting from the reaction of an isocyanate compound containing an ethylenic unsaturation with a surfactant compound containing a hydroxyl function reactive to the isocyanate group of

the isocyanate compound (D6: Claim 1, page 4, lines 14 to 16). The presence of a urethane linkage in D6 as opposed to the ester linkage in the patent in suit was acknowledged by the Appellant (section IV(3), above).

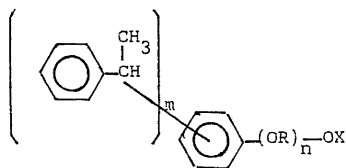
3.7.4 Whilst, according to page 3, lines 38/39 of D6, the nature of a particular functional monomer has been shown to be a determining factor in the rheological action of the charged and/or pigmented compositions containing the corresponding thickening agent, D6 does not, as already addressed in section 3.7.1, above, provide any particular information concerning the nature of the surfactant alcohol bound in the particular functional monomer component of the (prior art) acrylic associative thickening agents (D6: page 3, lines 33 to 37 and 40 to 44). Instead, D6 refers to the disadvantages of those acrylic thickening agents (section 3.7.2, above), which were to be overcome, and focuses on the solution to these problems, which was found in the use of the functional monomer component (c) containing at least one urethane group.

Thus, particular reference is made on page 3, lines 45 to 48 of D6 to the beneficial effect (on the rheological behaviour of the charged and/or pigmented compositions and in particular paints) provided by the presence of -O-C(O)-NH-urethane groups in the lateral chains of the copolymer resulting from the condensation of a surfactant alcohol and an unsaturated isocyanate to the particular functional monomer (c).

3.7.5 The nature of surfactant alcohols having an OH-group *reactive to the -NCO group* to form the above component (c) is further explained on page 5, lines 14 to 29 of D6. Only in this context is mention made of oxy-ethylated mono-, di- and tristyryl phenols (D6: page 5,

- lines 48 to 51) within a list of conceivable alcohols suitable for this specific purpose, equally including the oxyethylated dilauryl amines, octyl and nonyl phenols and the oxyethylated long chain alkyl (ie lauryl, stearyl and cetyl) alcohols.
- 3.7.6 Moreover, all of 88 monomers according to component (c) as exemplified in Table I of D6 ("M1" to "M88") were urethane group containing reaction products either (i) of a diisocyanate with, on the one hand, an oxyethylated surfactant alcohol (ie C_{16...18}/cetyl-stearyl alcohols, C₁₂/lauryl alcohol, NP/nonyl phenol or DSP) and, on the other hand, an unsaturated compound selected from allyl alcohol, ethylene glycol acrylate or methacrylate, poly(EO)-ethyl methacrylate or allyl amine, or (ii) of one the above oxyethylated surfactant alcohols with isocyanato-ethyl methacrylate or meta-isopropenyl dimethylbenzyl isocyanate (m-TMI). Only eight of these 88 monomers contained DSP groups.
- 3.7.7 Furthermore, within a list of 42 copolymers in Table II of the document, only one, viz. copolymer AG, was based on a DSP group containing monomer (c) ("M10") (cf. section V(5), above). This monomer "M10" had been the urethane group containing reaction product of allyl alcohol, toluene diisocyanate and oxyalkylated DSP containing an average of 15 EO units.
- 3.8 Reference was additionally made by the Appellant to two further documents, D4 and D7, neither of which relates to copolymers as referred to in section 3.2, above.
- 3.8.1 Thus, D4 refers to a process for the emulsion polymerisation of vinyl monomers which yields a polymer latex with low filtration residues (D4: page 2, lines 3/4). The polymerisation is carried out in the presence of emulsifiers, which are alkoxyated aralkyl

phenols of the formula (I):



wherein X is a hydrogen atom or an ionic sulphate group (-SO₃M). The document does not contemplate at all the esterification between a monomer and the emulsifier or the polymer product and the emulsifier, in the sense of the "in situ" scenario of the Appellant (SGA: pages 5/29 and 14/29).

- 3.8.2 Document D7 relates to emulsifiers similar to those of D4 (X = H). However, unlike D4, D7 does not even refer to the use of these emulsifiers in polymerisation reactions, but describes the suitability of these compounds for producing emulsifiable concentrated solutions of active materials (as used in the field of plant protection) which are then diluted to obtain emulsions which are ready for use (D7: column 1, lines 13 to 16 and column 2, lines 21 to 27).
- 3.9 The question of inventive step is, in general, dealt with in proceedings before the EPO by means of the so-called problem-solution approach which includes several sequential steps. In step one, the closest prior art is established; in step two, the technical problem to be solved with regard to this closest prior art is defined and it is investigated whether this problem has credibly been solved. Finally, it is decided whether the solution found can be derived in an obvious way from the cited documents (cf. Case Law of the Boards of Appeal of the EPO, 5th Edition, 2006, Chapter I.D.2).
- 3.9.1 *"As is generally recognized in the jurisprudence of the Boards of Appeal, in cases where a claimed invention is attacked on the basis of more than one prior document each*

belonging to the same technical field as the claimed invention, the closest prior art is the prior document, starting from which the claimed invention could most easily have been made by a skilled person at the filing date. As stated in decision T 254/86, OJ EPO 1989, 115, in paragraph 15, 'the objectively closest state of the art is the most promising springboard towards the invention which was available to the skilled person.' In each case, the objective choice of the closest prior art document depends upon the nature of the claimed invention and of the disclosures in the relevant prior documents." (T 656/90 of 13 November 1991, not published in OJ EPO, No. 1.1 of the reasons).

3.9.2 As shown in sections 3.2 to 3.7.7, above, in the present case, the "*claimed invention is attacked on the basis of more than one prior document each belonging to the same technical field as the claimed invention*". Hence it must be established, from which of the documents (sections III(1) and IV(4) to IV(8), above: D1, D2 (or D5), D3, or D6) "*the claimed invention could most easily have been made by a skilled person at the filing date*", or in other words, which of the prior art documents "*is the most promising spring board towards the invention ...*" and thus must be considered as being the closest state of the art (cf. section 3.9.1, above).

3.9.3 The reference to "*the general structure of the polymer chain*" (emphasis added) as being common general knowledge and forming the closest state of the art (section IV(5), above) is, in the Board's opinion, however a clear indication for an *ex post* analysis and, hence, an improper hindsight reasoning, because, in the absence of any hint in this connection to a particular prior art document, this formulation can only refer to the polymer according to the present claims.

3.9.4 The copolymer of D1 is based on a specific third comonomer component, which contains a hydrophobic fatty chain group linked via oxyalkylene groups to an ethylenically unsaturated group. The hydrophobic groups may be alkyl, alkylaryl, aralkyl or aryl groups having ≥ 26 C atoms (sections 3.3 and 3.3.1, above).

The addition of the above copolymers of D1 to aqueous compositions aims at an increased thickening of these compositions at low shear gradients without notably increasing the viscosities, contrary to prior art polymers (section 3.3.2, above).

According to the tests and comparative tests in the examples of D1, the length of the alkyl group in the surfactant monomer has a significant influence on the viscosities of aqueous compositions at different shear rates. In Example 2, it has furthermore been shown that a copolymer having hydrophobic groups on the basis of nonyl phenol, like those on the basis of the alkyls having < 26 C atoms in the other comparative tests, show inferior results. (sections 3.3.3 and 3.3.4, above).

3.9.5 The copolymers of D2 comprising, besides comonomer units (a) and (b), (meth)acrylic monomer moieties (c) with $C_{8...16}$ alkyl aryl, eg nonyl phenol, or with $C_{8...20}$ alkyl groups (cf. [page 3, lines 12 to 17]) linked to the (meth)acrylic group via poly(oxyalkylene) groups are to serve as very effective polymeric thickeners for many aqueous systems when treated with a base. A particular concern is controlling the paint rheology to obtain proper flow and levelling with a minimum of dripping and spattering (section 3.4, above).

3.9.6 Polymers of this kind are also referred to in D5, where they are, however, used only in combination with

urethane polymer thickening agents and serve as syneresis reducing agents (section 3.6, above).

- 3.9.7 As shown in section 3.5, above, D3 is much less specific than D2 with regard to the composition of its thickening polymers, except for the composition of their hydrophobic terminal groups as listed in Tables 1 to 4, which comprise only alkyls of up to 20 C atoms (ie "eicosyl") and alkyl phenyl groups, the alkyl chain length of which may range up to 20.
- 3.9.8 Whilst mentioning prior art acrylic associative thickening agents as such, however without providing a clear explanation of their compositions, D6 refers to some clear disadvantages of those acrylic associative thickening agents (sections 3.7.1 to 3.7.5, above). In order to overcome those disadvantages, D6 clearly teaches to use polymers having their hydrophobic groups linked to the polymer chain by urethane groups and, thus, teaches away from using acrylic ester copolymers (D6, page 3, lines 45 to 48). Not even a single example or comparative examples in D6 could serve as a basis as an appropriate starting point.
- 3.10 On the basis of these findings, the Board takes the view that D2 represents the closest piece of the cited prior art, since it considers several aspects similar to those in the aim of the patent in suit (section 3.1, above). The technical problem to be solved with regard to D2 can be seen in the provision of a more effective thickening agent than that of D2, without impairment in respect of its easy preparation from available chemical materials by known process technology and its effective dispersion into the system to be thickened.
- 3.11 The solution found is defined in Claim 1.

3.12 It is evident that the starting material had been available (see eg D4 or D7 or the table on pages 10 to 12 of the rejoinder), that the copolymers could be easily made from the monomers ([Examples 1 and 2]) and that the resulting thickening agent could be easily incorporated into the aqueous system to be thickened (cf. the table bridging [pages 10 and 11]).

Moreover, the results in [Tables I to III] demonstrate that the thickening agents according to the claims are highly effective in comparison with conventional thickening agents of the market (the Rheolate[®] or the Acrysol[®] thickening agents used as comparative products). Moreover, in view of the [examples], the arguments and further experimental results of the Respondent, none of which has been refuted by the Appellant, the Board sees no reason to deviate from the finding in the decision under appeal concerning the experiments disclosed in Appendix F of the Opponent. Instead it has come to the conclusion that the above aspects to the technical problem were in fact solved in accordance with the claims (sections III(12): reference to an improvement; V(3): technical problem and its solution; IX(4): simplicity of the manufacture of monomer component (c); IX(5): viscosity behaviour of a thickened aqueous system; and V(6)/IX(6): lower amount of thickening agent according to the claims needed, all sections as referred to above).

By contrast, the Board cannot accept the Appellant's arguments concerning the composition of the copolymer in the thickening agent and the amount of the agent necessary for thickening (cf. section IV(3), above: "... *UNimportant ...*", "... *with no demonstration whatsoever of what the ACTUAL impact was ...*"), in particular in view of the fact that the onus of proof for the assertions had

been on the opposing Appellant. It has, however, not discharged this burden. Thus, the Board cannot refute the Respondent's argument (cf. sections V(6) and IX(6), above) that the results in the additional Appendix J were not based on an appropriate comparison.

3.13 In summary, the Board therefore takes the view that the problem to be overcome (section 3.10, above) has in fact credibly been solved.

4. *Novelty*

4.1 As addressed in sections IV(1) to IV(3), above, the Appellant reiterated its objection of lack of novelty on the basis of D1 and D6, respectively.

4.2 It did not, however, make any reference to a single site in D1, which directly and unambiguously refers, as regards its claimed copolymer, to the presence of any monomer moiety derived from a compound having a terminal group R' in compliance with the definition of the aralkyl phenoxy group R⁷ in the operative Claim 1.

4.2.1 As already mentioned in sections 3.3 to 3.3.4, above, the copolymer of D1 contains moieties derived from a monomer component (c) having a hydrophobic terminal group R' represented by the linear or branched alkyl, alkyl aryl, aralkyl, or aryl groups having ≥ 26 C atoms, preferably ≥ 30 C atoms, or, preferably, R' represents a hydrophobic C₂₈ alkyl group, linear or branched, with a number of alkylene oxide (units) within the range of 10 to 70. Exemplified was the use of copolymers wherein the hydrophobic group R' was an alkyl with ≥ 28 C atoms. The only comparison wherein R' had not been an alkyl with < 26 C atoms was Test 16, based on a copolymer wherein R' had been nonyl phenoxy.

4.2.2 Contrary to the Appellant's opinion as presented in the SGA (section IV(2), above), the Board concurs, therefore, with the finding in the decision under appeal that "*the entirety of the features characterising the hydrophobic group R⁷ of the present subject-matter is not disclosed directly and unambiguously in this prior art document*". In other words, D1 does not disclose an *aralkyl phenoxy group* in accordance with R⁷ (cf. the Respondent's opinion in section V(4), above). In the Board's view, the terms of alkyl, alkylaryl, aralkyl and aryl have clear meanings, which can best be elucidated by means of some examples: lauryl or dodecyl (C₁₂H₂₅-) is the monovalent radical derived from dodecane by abstraction of one hydrogen atom. Analogously, alkyl aryl can be exemplified by methyl phenyl (CH₃-C₆H₄-), aralkyl by benzyl (C₆H₅-CH₂-) and aryl by phenyl (C₆H₅-). This leaves no room for a broader interpretation, as suggested by the Appellant.

4.3 As already set out in sections 3.7 to 3.7.7, above, D6 discloses thickening agents on the basis of copolymers based on comonomer moieties derived from a surfactant comonomer component (c) containing, as acknowledged by the Appellant, at least one urethane function (sections IV(3) {paragraph 2} and 3.7.3, above). As furthermore shown in section 3.7.4, above, the urethane was not only a linking group inside a monomer (c) moiety as suggested by the Appellant, but had a beneficial effect on the rheological behaviour of the compositions comprising the thickening agents of D6.

4.3.1 Whilst D6 contains some comparative examples describing copolymers free of such urethane groups (sections 3.7.1 and 3.7.4, above), it cannot be derived from D6 that any polymer forming the acrylic associative thickening agents referred to in its description or any polymer as

used in its comparative examples would comply with the requirements of Claim 1.

- 4.3.2 Therefore, it must be concluded that D6 does not contain a direct and unambiguous disclosure anticipating the subject-matter according to the definitions in the independent Claims of the Main Request (cf. sections I, II and V, above).
- 4.4 According to established jurisprudence (cf. Case Law of the Boards of Appeal of the EPO, 5th Edition, 2006, chapters I.C.1.9 to I.C.2.5), it is prerequisite for the acceptance of lack of novelty that the claimed subject-matter is "*directly and unambiguously derivable from the prior art*". In other words, it has to be "*beyond doubt - not merely probable - that the claimed subject-matter was directly and unambiguously disclosed in a patent document*" (cf. also T 1029/96 of 21 August 2001, not published in OJ EPO, No. 2.8 of the reasons). This includes that novelty of the claimed subject-matter vis-à-vis a prior art document cannot be opposed on the basis of only equivalents to the features directly and unambiguously disclosed in the cited document (cf. T 167/84, OJ EPO 1987, 369, No. 6 of the reasons, and T 928/93 of 23 January 1997, not published in OJ EPO; No. 2.1.3, last sentence).
- 4.5 Consequently, the Board has no reason to take a view different from the assessment of novelty vis-à-vis D1 and D6, respectively, as set out in the decision under appeal (see section III(2), above). Evidently, D1 does not disclose a copolymer comprising surfactant monomer moieties having a hydrophobic group identical to R⁷ as defined in Claim 1 of the patent in suit. Nor has it been shown that any one of the associative thickening agents disclosed in D6 complied with the definitions in

Claim 1 of the Main Request. By the same token, this finding is also valid for the further claims all of which are appendant to Claim 1.

4.6 Consequently, the subject-matter of the Main Request is novel over the disclosures of each of D1 and D6.

4.7 Since no further objections of lack of novelty have been raised, it is, therefore, concluded that the requirements of Article 54 EPC are fulfilled by the subject-matter of the present claims of this request.

5. *Inventive step*

5.1 It remains to be decided whether the claimed invention found can be derived in an obvious way from the cited documents.

5.2 In section 4.2.1 and 4.2.2, above, the Board has found that alkyl, alkyl aryl, aralkyl or aryl groups (as referred to in D1) are not identical with aralkyl phenoxy groups. This finding is, of course, also valid for D2 (cf. section 3.4, above). Moreover, the Board takes the view that none of the groups mentioned in D1 or D2 even encompasses the aralkyl phenoxy groups. Nor does D2 itself provide any incentive to modify its teaching so as to arrive at something within the meaning of Claim 1 of the Main Request with the expectation of obtaining a thickening agent having a higher efficiency (cf. section 3.10, above). D2 only suggests to increase the chain length of the terminal alkoxy or alkyl phenoxy group (section 3.4, above, last paragraph).

5.3 The same suggestion for achieving an increased thickening efficiency can be derived from D1 (cf. sections 3.3 to 3.3.4, above). It refers to the use of a comonomer (c) having alkyl-poly(EO) or alkyl phenol-

poly(EO) groups with ≥ 26 C atoms, ie longer than the corresponding components as taught in D2. This does not, however, provide any incentive to replace those hydrophobic groups by aralkyl phenoxy groups.

- 5.4 The above finding is also valid for D3, which encompasses a broad range of hydrophobic end groups without the slightest hint to consider a monomer component (c) having a hydrophobic aralkyl phenoxy end group linked to a (meth)acrylic ester group by means of an oxyalkylene chain within the definition of component (c) of Claim 1.
- 5.5 Whilst describing that DSP and TSP compounds can be used as emulsifiers in the emulsion polymerisation of non-ionic vinyl monomers, D4 (section 3.8.1, above) does not contain the slightest hint to an incorporation of the emulsifier into or its addition to the resulting emulsion polymerisate.
- 5.6 Document D5 characterises the copolymer of D2 only as being a syneresis reducing compound, which can be combined with an additional urethane polymer thickener.
- 5.7 This teaching in D5 even supports the discussion of the prior art in D6, because D6 (sections 3.7 to 3.7.7 above, above) clearly warns the person skilled in the art against using thickening agents on the basis of associative acrylic polymers showing clear disadvantages. The document puts a particular emphasis on the beneficial effect which can be achieved by using, instead of the associative acrylic polymers, copolymers containing their surfactant hydrophobic end groups linked via urethane linkages to the polymer chain (section 3.7.4, above, paragraph 2).
- 5.8 Document D7 relates to DSP and TSP compounds which can be used for the emulsification of active substances as

used for plant protection (cf. section 3.8.2, above). There is not the slightest hint in this document to copolymers, let alone to copolymers containing pendant aralkyl phenoxy groups linked via polyoxyalkylene chains to (meth)acrylate moieties in the polymer chain.

5.9 In summary, as shown in the preceding sections, the group of secondary documents cited by the Appellant, ie D1 and D3 to D7, can be divided into several subgroups:

- (i) D1 and D3 disclosing copolymers having hydrophobic alkyl or aralkyl terminal groups attached via polyoxyalkylene chains to the polymeric chain;
- (ii) D6 relating to copolymers containing hydrophobic terminal aralkyl phenoxy groups linked via poly-(oxyalkylene) chains as pendent groups to the polymer chain;
- (iii) D4 and D7 relating to DSP and TSP compounds which can be used as free emulsifiers and
- (iv) D5 relating to mixtures wherein the copolymer of D2 is referred to as a syneresis reducing compound.

None of these groups provides a hint how to improve the efficiency of the copolymer of D2, let alone is there a suggestion to achieve this goal by replacing the hydrophobic terminal groups of D2 by aralkyl phenoxy groups such as DSP or TSP-based groups. As already found by the Opposition Division (section III(14), above) any suggestion to do so can only be based on an ex post facto analysis, ie can be contemplated in the knowledge of the solution of the patent in suit. This finding is clearly corroborated by D6, because any suggestion for such a replacement would be against the clear, direct and unambiguous teaching in D6 (D6: page 3, line 54 to page 4, line 1 and in particular,

page 3, lines 45 to 48). The only suggestion made in D2 itself and supported by D1 refers to longer chain lengths of the alkyl or alkyl aryl groups (sections 5.2 and 5.3, above).

- 5.10 Furthermore, the Appellant's argument concerning the alleged shift towards bulky hydrophobic groups of the kind as R⁷ of the patent in suit (section IV(4), above), is not convincing for at least two reasons:
- 5.10.1 Firstly, the argument has been based on a limited number of documents purposively selected by the Opponent for the filing of an opposition. It has not been shown that these documents would represent a complete survey of the prior art in this field.
- 5.10.2 Secondly, in D1 a priority date of 1 July 1992 was claimed, which is the latest priority date of all documents cited in the Notice of Opposition. Contrary to the Appellant's argument, D1 does not, furthermore, provide a single inventive example based on a copolymer containing a hydrophobic terminal substituted-aryl-poly(oxyalkylene) (meth)acrylate, which would demonstrate any improvements concerning the thickening effect (see section 5.9, above), but showed rather a trend to long-chain alkyl hydrophobic terminal groups. Nor does D1 contain any inventive example showing any effects on the sagging or the levelling of aqueous compositions, eg of paints.
- 5.11 On the basis of these facts and findings, the Board has come to the conclusion that the claimed subject-matter is also based on an inventive step. This finding is not only valid for the composition of Claim 1, but by the same token also for the composition of Claim 9 and the processes according to Claims 7 and 10, all of which include the limitations and definitions of Claim 1, and,

furthermore, for the elaborations in the dependent claims.

6. Consequently, the request of the Appellant must fail, whereas the Main Request of the Respondent prevails.

Auxiliary Requests

7. In view of the above findings, there is no need further to consider the Auxiliary Requests of the Respondent.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young