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**D E C I S I O N**  
**of 21 September 2005**

**Case Number:** T 1188/01 - 3.3.07

**Application Number:** 95940924.4

**Publication Number:** 799086

**IPC:** B01D 61/44

**Language of the proceedings:** EN

**Title of invention:**

Electromembrane processes for the treatment of kraft mill  
electrostatic precipitator catch

**Patentee:**

Pulp and Paper Research Institute of Canada

**Opponent:**

Eka Chemicals AB

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 123(2)

**Keyword:**

"Amendments - allowable (no) "

**Decisions cited:**

T 0329/99

**Catchword:**

-



Case Number: T 1188/01 - 3.3.07

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.07  
of 21 September 2005

**Appellants:** Pulp and Paper Research Institute of Canada  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted on 23 August 2001  
revoking European patent No. 799086 pursuant to  
Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** R. Teschemacher  
**Members:** G. Santavicca  
B. Struif

## Summary of Facts and Submissions

I. The grant of European patent 0 799 086, in respect of European patent application 95 940 924.4, originating from international application PCT/CA95/00709 filed on 20 December 1995 and claiming a right of priority in the U.S.A. of 22 December 1994 (US 08/362,200), was published on 3 March 1999. The only independent claim read as follows:

"1. A single-stage process comprising:

- (a) providing a cell (1,21,31) comprising an anode (5, 24,34), a cathode (6,25,35) and at least two compartments therebetween separated by a monovalent anion-selective membrane (3,23,33),
- (b) feeding an aqueous solution of a mixture of alkali metal salts of monovalent and polyvalent anions into a first of said compartments to contact a first side of said monovalent anion-selective membrane,
- (c) feeding a liquid comprising water into a second of said compartments to contact a second side of said monovalent anion-selective membrane (3,23,33),
- (d) passing a direct current through said cell between the anode (5,24,34) and cathode (6,25,35) to effect migration of said monovalent anions from said first compartment through said monovalent anion-selective membrane (3,23,33) into said second compartment, and
- (e) recovering a solution of alkali metal salts of the polyvalent anions depleted in salts of the monovalent anions from said first compartment,

and wherein said monovalent anions in (b), (d) and (e) are chloride ions, said aqueous solution in b) is

alkaline and contains hydroxide ions, and is substantially free of the polyvalent metal ions, said chloride ions migrating through said monovalent anion-selective membrane and said hydroxide ion remaining in said solution recovered in step (e)."

II. A notice of opposition was received on 2 December 1999, in which revocation of the patent was requested on the grounds that the claimed subject-matter lacked novelty and inventive step (Article 100(a) EPC), in particular having regard to document D1 (JP-A-22 051 - 1980, English translation of the full-text document), and that the invention underlying the patent in suit was not sufficiently disclosed (Article 100(b) EPC).

III. In a decision posted on 23 August 2001, which was based on the claims as granted as the sole request, the Opposition Division revoked the patent. The reasons of that decision are, in substance, as follows:

(a) As to sufficiency of the disclosure, none of the examples in the patent in suit showed a preferred migration of chloride anions with respect to hydroxide anions, as required by Claim 1 in suit. Instead, it appeared from the facts of the case and the arguments submitted that the required selectivity would depend on the respective concentrations of those anions rather than on the availability of any truly selective chloride anion/hydroxide anion membrane. Since a 100% selectivity was not intended by the definition in Claim 1, the skilled person was thus provided with sufficient teaching in order to carry out the

claimed subject-matter. Consequently, the requirements of Article 83 EPC were fulfilled.

(b) As regards novelty, D1 disclosed all the features of independent Claim 1 in combination. In particular, the Opposition Division pointed to the following:

- (i) the opposed patent and D1 used the same membranes;
- (ii) the solutions in the process of D1 were alkaline;
- (iii) the alleged use of mirabilite in the process according to D1 had not been proven.

Since the subject-matter of Claim 1 was not novel, and the dependent claims fell with the main claim, the patent should be revoked.

IV. On 1 November 2001, the patentees (appellants) lodged an appeal against that decision; the fee for appeal was paid on the same day.

In their statement setting out the grounds of appeal, received on 2 January 2002, the appellants *inter alia* enclosed an amended Claim 1 as auxiliary request.

Then, in a letter dated 15 June 2005, the appellants enclosed three sets of amended claims, as the main request and auxiliary requests Nos. 1 & 2 respectively, an amended Paragraph 0017 of the description as well as further documents, in particular consolidated grounds of appeal.

Finally, in a letter dated 11 August 2005, in response to a communication of the Board (see point VI, *infra*),

the appellants enclosed three further sets of amended claims as main request and auxiliary requests Nos. 1 & 2 respectively, replacing all the requests then on file. In that letter (point 23), the appellants also announced that they wished the matters to be decided on the basis of the written documentation and that they did not intend to attend the oral proceedings scheduled for the 21 September 2005. The wording of Claim 1 according to the final requests is as follows:

*Main Request*

"1. A single stage process comprising:

(a) providing a cell (1,21,31) comprising an anode (5, 24,34), a cathode (6,25,35) and at least two compartments therebetween separated by a monovalent anion-selective membrane (3,23,33);

(b) feeding an aqueous solution of a mixture of alkali metal salts of monovalent and polyvalent anions into a first of said compartments to contact a first side of said monovalent anion-selective membrane;

(c) feeding a liquid comprising water into a second of said compartments to contact a second side of said monovalent anion-selective membrane (3,23,33);

(d) passing a direct current through said cell between the anode (5,24,34) and cathode (6,25,35) to effect migration of said monovalent anions from said first compartment through said monovalent anion-selective membrane (3,23,33) into said second compartment;

(e) recovering a solution of alkali metal salts of the polyvalent anions depleted in salts of the monovalent anions from said first compartment; and

(f) wherein said monovalent anions in (b) and (d) and (e) are chloride ions; characterised in that

(g) said aqueous solution in b) is alkaline and contains hydroxide ions and comprises a solution to be recovered of the catch (106) of an electrostatic precipitator (ESP) of a kraft pulp mill chemical recovery boiler;

(h) said process comprises a pre-treatment step to remove membrane-fouling contaminants from said ESP solution to be recovered, by making the solution alkaline using sodium hydroxide and/or carbonate to precipitate the hydroxides or carbonates of multivalent metals whereby the solution is substantially free of polyvalent metal ions;

(i) said process causing said chloride ions to migrate preferentially through said monovalent anion-selective membrane with respect to hydroxide ions remaining in said solution recovered in step (e)."

*Auxiliary Request No. 1*

Claim 1 according to auxiliary request No. 1, compared to Claim 1 according to the main request, additionally contains at the end the following feature:

"(j) said direct current is at a current density of about 25 to 250 mA/cm<sup>2</sup>".

*Auxiliary Request No. 2*

Claim 1 according to auxiliary request No. 2, compared to Claim 1 according to auxiliary request No. 1, does not contain the expression "characterised in that", i.e. the claim is not drawn up in a two-part form.

V. In response to the grounds of appeal filed by the proprietors, the opponents (respondents) enclosed two further documents, commented on the new claims then on file and requested oral proceedings (letter dated 23 September 2002).

By letter dated 15 July 2005, the respondents withdrew their request for oral proceedings and requested that the case be decided based on the material and arguments already filed.

VI. In a communication dated 30 June 2005, in preparation of the oral proceedings scheduled for 21 September 2005, the Board indicated the points to be discussed and drew attention to the questions arising in connection with the amended claims then on file, e.g. whether the amended claims had a direct and unambiguous basis in the description as filed (Article 123(2) EPC), in particular:

- (a) whether the expression "migrate preferentially" in step (i) was directly and unambiguously disclosed in the application as filed; and,
- (b) as regards the auxiliary requests, whether the introduction of new feature (j) in Claim 1 extended the content of the original description.

In a further communication, dated 11 August 2005, in reaction to the withdrawal of the opponents' request for oral proceedings, the Board informed the parties that the date fixed for oral proceedings was maintained.



VII. Oral proceedings were held on 21 September 2005. Nobody appeared for the parties, as announced in their letters of 15 July and 11 August 2005, respectively. The oral proceedings were thus continued in their absence, in accordance with Rule 71(2) EPC.

VIII. As far as the amendments to the claims are concerned, which is the only issue addressed by this decision, the appellants, in their written submissions, argued essentially as follows:

*Main request*

- (a) The solution in step (b) was a solution of the ESP catch, as defined in Claim 3, then cancelled;
- (b) the pre-treatment step to remove fouling contaminants in step (h) was based on the section of the description entitled "Pre-treatment of the ESP catch", notably on step (c) of the process illustrated therein, as well as on several further passages and examples in the specification;
- (c) Those amendments made clear the origin of the solution to be treated in step (b) and that its alkalinity was provided in a pre-treatment step which precipitated out the multivalent metals which were present in said solution in step (b);
- (d) the preferential ionic transfer of chloride ions with respect to hydroxide ions in step (i), was based on relevant passages in paragraphs 0085 and 0117 of the description. In this respect, it did not matter that those references related to

"hydroxide ions generated in the first compartment", since, obviously, the selectivity of the membrane with respect to given anionic species would be effective whatever the origin of those anions was;

- (e) as regards the expression "migrate preferentially", the application did not use those words explicitly. However, paragraph 0117 of the description amounted to a direct and unambiguous disclosure of that preferential migration, in particular by the phrase "causing monovalent anions such as chloride ions to migrate towards the anode 24 across the monovalent anion-selective membrane 23". Since the concept of ionic migration was fundamental to electrochemistry, it had in itself a clear meaning to the skilled person. Hence, the meaning of "migrate preferentially" was clear although it would never mean a 100% preferential migration;
- (f) since the anion selective membrane, as shown in any of Figures 1, 3 and 5, was the essential structural element of the claimed process, and since the examples provided full and adequate basis for the process as claimed, the objection raised by the opponents that the process of Claim 1 was always carried out with bipolar membranes, had no substance.

Therefore, the amendments to Claim 1 were fully and adequately supported by the description of the opposed patent.

*Auxiliary Request No. 1*

- (g) Feature (j) in Claim 1 of auxiliary request No. 1 was based on Claim 35 of the patent specification. Claim 35 was dependent on Claim 4, which was dependent on Claim 1. That electro dialysis systems could be operated under similar conditions as the water splitters was mentioned in Paragraph 0094 of the description. In particular, this amendment limited further the scope of Claim 1 as granted.

*Auxiliary Request No. 2*

- (h) Claim 1 of auxiliary request No. 2 was identical to Claim 1 according to auxiliary request No. 1 but had not been drawn up in a two-part form.

Therefore, the amendments to the claims of any of the three requests were based on the application as filed. Hence, the requests were allowable.

Also, the amendments were occasioned by the grounds of opposition, namely the alleged lack of novelty over D1.

IX. The arguments of the respondents in their sole submission (letter dated 23 September 2002), as far as they are applicable to the amendments to the present claims, can be summarised as follows:

- (a) Compared with Claim 1 as granted, amended Claim 1 contained the following amendments:

- (i) The aqueous solution in step (b) comprised a solution of the catch of an electrostatic precipitator of a kraft pulp mill recovery boiler;
  - (ii) the process also comprised a pre-treatment step to remove membrane-fouling metallic contaminants by making the solution alkaline so as to precipitate the hydroxides of multivalent metals; and,
  - (iii) said process caused said chloride ions to migrate through said monovalent anion-selective membrane and said hydroxide ions to remain in said solution recovered in step (e).
- (b) Solutions from step (b) in any of Examples 3, 6 and 7 were not alkaline.
- (c) In Example 1 of the patent in suit bipolar membranes were used to treat a ESP catch solution and, to avoid any membrane-fouling problems, the ESP catch solution was subjected to a pretreatment in four-steps, *inter alia* by making the solution alkaline so as to precipitate the hydroxides of multivalent metal contaminants in the ESP catch solution, which precipitate had to be withdrawn or separated from the solution in a further step.
- (d) However, that pre-treatment step to remove membrane-fouling metallic contaminants by making the solution alkaline was only a necessary pre-

treatment step when bipolar membranes were used and the ESP ashes were not alkaline.

- (e) The process as illustrated in Examples 1 to 5 of the patent in suit was always carried out with bipolar membranes and only when using bipolar membranes the risk of precipitation of hydroxides of multivalent metals could be a problem.
- (f) Therefore, the passages mentioned by the proprietors as a support for the amendments to the claims only referred to the use of water-splitting cells with bipolar membranes and monovalent anion-selective membranes, as shown in Figures 1 and 3 of the patent in suit;
- (g) Hence, the process as defined in Claim 1 lacked a general basis and the achievement of the alleged effects was questionable.

X. The appellants (patentees) requested that the decision under appeal be set aside and that the patent be maintained on the sets of claims either according to the main request or according to one of the two auxiliary requests all filed with letter dated 11 August 2005.

In addition, the appellants requested that any outstanding informality not going to the substance of the invention be treated after remittal by the department of first instance.

XI. The respondents (opponents) requested that the appeal be dismissed.

## Reasons for the Decision

1. The appeal is admissible.

### *Main request*

2. *Amendments*

- 2.1.1 Compared to Claim 1 as granted, Claim 1 according to the main request contains the following amendments:

- (a) "characterised in that", at the end of feature (f);
    - (b) "and comprises a solution to be recovered of the catch (106) of an electrostatic precipitator (ESP) of a kraft pulp mill chemical recovery boiler", in feature (g);
    - (c) "said process comprises a pre-treatment step to remove membrane-fouling contaminants from said ESP solution to be recovered, by making the solution alkaline using sodium hydroxide and/or carbonate to precipitate the hydroxides or carbonates of multivalent metals whereby the solution is substantially free of polyvalent metal ions", i.e. new feature (h); and,
    - (d) "said process causing said chloride ions to migrate preferentially through said monovalent anion-selective membrane with respect to hydroxide ions remaining in said solution recovered in step

(e)", added at the very end of Claim 1 as new feature (i).

- 2.1.2 It can be left undecided whether or not in view of amendments (a) to (c) above Claim 1 fulfils the requirements of the EPC, since the appeal must in any case fail because in view of amendment (d) Claim 1 is not allowable.
- 2.1.3 As regards amendment (d), Claim 1 does not define any specific concentrations of chloride and hydroxide ions in the solution to be treated in step (b) nor any specific electro-membrane systems in which the process is carried out with the preferential transfer. Hence, the expression "migrate preferentially" encompasses any preferred migration of chloride ions over hydroxide ions in any electromembrane system, containing any monovalent anion-selective membrane, whereby both anions are contained at any time in a solution to be treated under step (b).
- 2.1.4 To establish whether this amended Claim 1 has any basis in the description as filed, it is thus necessary to consider whether the description as filed directly and unambiguously discloses that the solution treated in step (b) is always alkaline, that under those conditions there is a preferential migration of chloride ions over hydroxide ions and that this preferential migration is not influenced by the electromembrane systems described, e.g. by the monovalent anion-selective membrane. Also, it is necessary to assess the context in which the relevant passages are given, in particular those invoked by the appellants as a direct and unambiguous disclosure for

- amended Claim 1 (see point VIII, paragraphs (d) and (e), *supra*), before establishing their content.
- 2.1.5 In general, the ESP catch solution to be treated in step (b) of Claim 1 typically contains at least one alkali metal cation selected from sodium or potassium ions, chloride ions and sulphate ions and may also contain carbonate ions as well as various inorganic and organic impurities (patent specification, page 5, lines 45-47; application as filed, page 11, last paragraph, last sentence). Since that solution may contain sodium or potassium carbonates, it thus can be already alkaline *per se*;
- 2.1.6 the process as defined in Claim 1 is carried out in an electromembrane system. According to the description, that electromembrane system may be a two-compartment electro dialysis cell or a two- or three-compartment water-splitting cell (patent specification, page 5, lines 51-52; application as filed, page 12, second paragraph);
- 2.1.7 the inorganic and organic impurities that can be present in the ESP catch solution require a pre-treatment before its introduction into any of the proposed electromembrane systems. This is not only generally disclosed (patent specification, page 5, line 54 to page 8, line 35; application as filed, page 12, point (ii), to page 17) but, in particular, applied to any of the exemplified systems;
- 2.1.8 the pre-treatment of the catch includes a number of steps (a) to (e), *inter alia* a step (c) of "making the solution alkaline, using sodium hydroxide and/or



carbonate to precipitate out the hydroxides and/or carbonates of the multivalent metals" (patent in suit, page 6, lines 25-32; application as filed, page 13, last two lines, and page 14, lines 1-14). Hence, the solution in step (b) may be alkaline as a consequence of that step (c) of the pre-treatment;

2.1.9 the extent of any alkalinity resulting from the pre-treatment of the catch solution, e.g. the relevant pH, is neither given nor exemplified quantitatively in the patent specification. Instead, the alkalinity of the solution treated in step (b) of Claim 1, i.e. independently from the pre-treatment, is described by way of expressions having a relative meaning, in particular:

(a) For the first embodiment illustrated, a three-compartment water-splitting cell, the conditions of the aqueous solution to be fed in step (b) can be either "slightly alkaline" or "slightly acidic" (patent specification, page 11, lines 6-11; application as filed, page 26, first full paragraph);

(b) for the second embodiment, a two-compartment water-splitting cell, the description mentions that:

(i) "In contrast to the three-compartment configuration, it is expected that, given the high pH of the salt/acid compartment, in the case of the two-compartment configuration, di- and/or multivalent metal ions present in the feed solution, such as

calcium, magnesium, manganese, chromium, nickel and iron, will not pose significant problems since these are likely to be suspended in solution in their hydroxide colloidal form. The feed solution should be free of organic contaminants such as phenolic-type lignin fragments since at the high pH of the salt/base compartment these are likely to be highly solubilized and are expected to migrate across the anion-selective membrane and precipitate within and foul this membrane. As in the case of the three-compartment configuration, membrane fouling problems can be minimized by suitably pre-treating the ESP catch before introduction into the water-splitting system." (patent in suit, paragraph 0076; application as filed, page 30, third full paragraph);

(ii) "surprisingly, the hydroxide generated in the first compartment migrates to the second compartment at a much slower rate than chloride, thereby leading to the build-up of appreciable concentrations of this anion in the first compartment in the form of alkali metal hydroxide" (patent in suit, paragraph 0085; application as filed, page 33, third full paragraph); and,

(iii) "Current is passed between anode 24 and cathode 25 through the water-splitting stack 21, causing monovalent anions such as chloride ions to migrate toward the anode 24

across the monovalent anion-selective membrane 23. In addition, water is split in bipolar membranes 22a and 22b with the hydrogen ions migrating into the acid compartments and the hydroxide ions migrating into the salt/base compartments. A surprising discovery of this invention is that, even though hydroxide ions are monovalent in nature, they do not begin to migrate through the monovalent anion-selective membranes until most of the chloride is depleted from this compartment. Accordingly, an alkali metal hydroxide is formed in each of these compartments (salt/base), and this alkali metal hydroxide is bled from the water-splitting stack 21 through stream 29 along with alkali metal sulfate depleted in chloride. The acid compartments between the cation-selective side of each bipolar membrane 22a and the adjacent monovalent anion-selective membrane 23 will contain hydrochloric acid which is bled from these compartments through stream 28." (patent in suit, paragraph 0117; application as filed, paragraph bridging pages 44 and 45).

- (c) for the third embodiment, a two-compartment electro dialysis cell, the first compartment of that cell, i.e. the compartment where the ESP catch solution is fed, is under "nearly neutral conditions" (patent specification, page 15, lines 5-9; application as filed, page 39, first paragraph).

(d) As regards the examples of the patent in suit:

- (i) In Example 1, the solution of ESP catch was pre-treated, inter alia "by making the solution alkaline to precipitate out the hydroxides of the multivalent metals" (page 18, line 27). The example does not disclose whether sodium carbonate or sodium hydroxide has been used nor which concentration of hydroxyl anions remains in the feed which is then treated in a three-compartment water-splitting cell.
- (ii) Example 2 is a continuation of Example 1, Example 3 is carried out under conditions similar to those of Example 2 and Example 4 uses a simulated ESP catch solution.
- (iii) In Example 5 a pre-treated ESP solution is fed to a two-compartment water-splitting cell. The example does not mention how the ESP catch was pre-treated. The sodium chloride contained in the ESP catch solution is split into hydrochloric acid and sodium hydroxide, and the latter remains in the salt/base compartment with the sodium sulphate depleted in sodium chloride. Example 5 thus repeats that the hydroxide anions generated by the bipolar membrane remain in the salt/base compartment. Example 5 also mentions that: "in the absence of sufficiently high chloride levels in the salt/base compartment, hydroxide ions

and not sulphate ions are transported to the acid compartment" (patent in suit, paragraph 0155, fourth sentence; application as filed, sentence bridging pages 69 and 70).

- (iv) Example 6 concerns a two-compartment ED cell as shown in Figure 5 and shows how a solution of simulated ESP catch is depleted of sodium chloride. Example 7 uses the cell used in Example 6 which is however run in the feed and bleed mode. These examples do not mention whether the feed is alkaline.

2.1.10 It is apparent from the above analysis that:

- (a) A migration of chloride ions at a higher rate than that of hydroxide ions is disclosed only in connection with one of the three described embodiments, i.e. the one using a two-compartment water-splitting cell, in which there is a common salt/base compartment, and in which hydroxide ions are generated by the bipolar membrane and remain in that compartment, unless the concentration of the chloride ions is not sufficiently high. According to that disclosure, under those particular alkaline conditions, a "much smaller" rate of migration of the hydroxide ions is observed. Furthermore, in this embodiment, the fouling caused by organic contaminants appears to be more critical than that produced by the inorganic contaminants, which in view of the alkaline conditions created by the generated hydroxide ions does not appear to raise any problems;

- (b) thus, the question whether that description amounts to a direct and unambiguous disclosure of the general feature "migrate preferentially" can be left undecided, since the claimed subject-matter is not restricted to a two-compartment water-splitting cell. This is also apparent from the formulation of the claims, wherein the first claim which is restricted to embodiments comprising bipolar membranes is Claim 4;
  
- (c) a preferential migration of chloride ions over hydroxide ions in connection with the further two embodiments is not disclosed. Instead:
  - (i) the first embodiment, i.e. the embodiment using a three-compartment water-splitting cell is expressly contrasted to the embodiment using a two-compartment water-splitting cell (see point 2.1.9(b)(i), *supra*), because high pH conditions prevail only in the salt/base compartment of the two-compartment water-splitting cell, whereas in the three-compartment water-splitting cell there is an independent base compartment and the pH conditions prevailing in the feed (or salt) compartment are only "slightly alkaline";
  
  - (ii) as to the third embodiment, i.e. the electrodialysis cell, it does neither contain any bipolar membrane nor any base compartment, i.e. hydroxide ions are not generated by any bipolar membranes, and the

conditions prevailing in the feed (or salt) compartment are said to be "slightly neutral". The application as filed does not disclose alkaline conditions in the feed, similar to those mentioned for the second embodiment, and a preferential migration of chloride ions, at any rate and concentrations, over hydroxide ions. In that third embodiment, encompassed by the terms of Claim 1, no preferential migration of chloride ions over hydroxide ions appears to occur.

Therefore, at least one embodiment of the application as filed does not provide any disclosure for the claimed generalized feature "migrate preferentially".

2.1.11 It follows from the above that Paragraphs 0085 and 0117 invoked by the appellants (see points VIII(d), *supra*) lie within the context of the description of a preferred embodiment, i.e. a two-compartment water-splitting cell as shown in Figure 3 and do not pertain to the disclosure of the other embodiments illustrated. Hence, the text passages referred to by the appellants do not amount to a direct and unambiguous disclosure for a general preferential migration of chloride ions over hydroxide ions as defined in Claim 1.

2.1.12 In this respect, the Board has not overlooked that a text passage concerning the acknowledgement of document D1 (patent in suit, page 4, lines 25-28) explicitly mentions, under certain conditions (feed solution substantially free of polyvalent metal ions, use of a

treatment solution which is alkaline and contains hydroxide ions), a preferred migration of chloride ions over hydroxide ions. However, this passage was introduced during the examination phase in order to acknowledge document D1 pursuant Rule 27(1) EPC, without having a basis in the application as filed. In this respect, the appellants have not invoked that text passage.

2.1.13 No other part of the application as filed discloses a general preferential migration of chloride ions over hydroxide ions independently from the concentration of chloride ions in any membrane systems.

2.1.14 Since Claim 1 is based on a generalisation of a "much smaller" transfer rate of hydroxide ions with respect to chloride ions, which was disclosed only in connection with a particular embodiment, under particular process conditions, there is no direct and unambiguous basis for a general preferential transfer rate occurring in all of the illustrated embodiments even if the process conditions may not be the same.

2.1.15 In this respect, the appellants also argued that:

- (a) "the invention defined in Claim 1 was indeed properly generic to all relevant parts of the specific description. In particular, Claim 1 was generic to bipolar and non-bipolar membranes. In fact, the essential structural claim element was the anion selective membrane" (points 32 and 33 of the letter dated 15 June 2005); and that,



- (b) "It did not matter that the reference was to hydroxide ions generated in the first compartment, as opposed to ions present as a result of pre-treatment, because, obviously, the selectivity of the membrane with respect to a given anionic entity will be effective whatever the origin of said anions" (Consolidated Grounds of Appeal attached to letter dated 15 June 2005, point 5.6, last sentence).

2.1.16 The Board notes that:

- (a) the application as filed does not directly and unambiguously disclose situations in connection with the first and the third embodiments where the pH of the feed stream is as high as that of the second embodiment because of the alkalisation in the pre-treatment step and in which the hydroxide ions do not migrate or migrate any less than the chloride ions, whichever anion-selective membrane is used and whatever the concentration of the chloride ions is. Any such embodiment falls under the terms of Claim 1.
- (b) Even if it may be "obvious" that the selectivity of the anion-selective membrane is the same whatever the origin of the hydroxide ions is and that the presence of hydroxide ions can be the result of the pre-treatment step of the feed, "obviousness" is not a criterion for assessing whether an amendment has been disclosed in the application as filed.

(c) This implies that particular technical embodiments in connection with the first and the third embodiments, which do not belong to the explicit or implicit disclosure of the application as filed, albeit they may be rendered obvious on the basis of the application as filed, cannot serve as a valid basis for amendments complying with the requirements of Article 123(2) EPC (Case Law of the Boards of Appeal of the EPO, 4th edition 2001, III.A.3.3, page 220 of the English version, in particular decision T 329/99).

2.1.17 Therefore, the patent in suit has been amended in such a way that it contains subject-matter which extends beyond the content of the application as filed (Article 123(2) EPC).

2.2 Consequently, the main request is not allowable.

#### *Auxiliary Requests Nos. 1 and 2*

### 3. *Amendments*

3.1 Claim 1 according to each of auxiliary requests Nos. 1 and 2 includes amendment (d) (see point 2.1, *supra*).

3.2 Hence, the reasons given in relation to the main request apply *mutatis mutandis* to the auxiliary requests (see points 2.1.1 to 2.1.17, *supra*).

3.3 In addition to the above, the auxiliary requests would not be allowable either, for the following reasons:

- 3.3.1 Claim 1 of each of the auxiliary requests defines that the direct current is at a current density of about 25 to 250 mA/cm<sup>2</sup>.
- 3.3.2 Since the definition of Claim 1 encompasses any of the electromembrane systems illustrated in the description and shown in the figures, this density also applies to an electro dialysis system according to Figure 5, which may now be run at a current density of about 250 mA/cm<sup>2</sup>.
- 3.3.3 In the application as filed, however, a current density of about 25 to 250 mA/cm<sup>2</sup> is disclosed only in connection with systems containing bipolar membranes, i.e. three- and two-compartment water-splitting cells according to Figures 1 and 3 (page 23, first full paragraph, and page 31, first paragraph).
- 3.3.4 In fact, in connection with electro dialysis cells as shown in Figure 5, the application as filed discloses a current density of only about 15 to 150 mA/cm<sup>2</sup> (page 36, last full paragraph).
- 3.3.5 This is also reflected in Claims 35 and 36 as filed (Claims 35 and 36 as granted), where a current density of about 15 to 150 mA/cm<sup>2</sup> applies to all embodiments of Claim 1, whereas a current density of about 25 to 250 mA/cm<sup>2</sup> applies to the embodiments of Claim 4, i.e. to the embodiments including bipolar membranes.
- 3.3.6 Paragraph 0094 of the patent in suit, invoked by the appellants, in particular the expression "and other experimental parameters", does not mention the current density, which in fact is mentioned in paragraph 0097. Further, although Claim 4 depends on Claim 1, Claim 1

- does not include the features of Claim 4. Therefore, the arguments of the appellants in support of that amendment are not convincing.
- 3.3.7 It follows from the above that an electrolysis cell, as shown in Figure 5 of the patent in suit, running at a current density of about 250 mA/cm<sup>2</sup> is not directly and unambiguously disclosed in the application as filed but now explicitly falls under the terms of Claim 1 according to any of the auxiliary requests.
- 3.4 Therefore, the patent in suit has been amended in such a way that it contains subject-matter which extends beyond the content of the application as filed (Article 123(2) EPC).
- 3.5 Consequently, none of auxiliary requests Nos. 1 and 2 is allowable.
4. The Board had expressly indicated in its communication that the amendments to the claims might not be allowable. In particular, the feature "migrate preferentially" was objected to.

The appellants have provided new claims which expressly maintain, in all of the requests, the objected feature "migrate preferentially" and arguments in support thereof which are not convincing.

The appellants have decided not to attend the oral proceedings and there are no clearly allowable requests on file, on the basis of which the Board might have reviewed the decision of the department of the first instance or remitted the case to that department.

Their request that any "outstanding information not going to the substance of the invention" be treated after remittal cannot apply to the above deficiencies under Article 123(2) EPC which have the consequence that there is no text of the patent for which the substantive requirements of the EPC can be examined.

**Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

C. Eickhoff

R. Teschemacher