

Commissioner=s Decision # 1306
D cision de la Commissaire # 1306

TOPIC: O00
SUJET: O00

Application No. : 2,188,489
Demande n  : 2,188,489

Commissioner=s Decision Summary

The rejected application related to solvents used in industrial processes in which it is desirable to remove acidic gases, such as carbon dioxide and hydrogen sulfide, from feed gas streams. The application was rejected on the grounds of obviousness in view of two United States patents. The Board agreed that the claimed subject matter was obvious and recommended that the application be refused.

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2,188,489 having been rejected under subsection 30(3) of the *Patent Rules*, has consequently been reviewed in accordance with subsection 30(6) of the *Patent Rules* by the Patent Appeal Board on behalf of the Commissioner of Patents. The findings of the Board and the ruling of the Commissioner are as follows:

Agent for the Applicant:

Smart & Biggar
Box 2999, Station D
Ottawa, Ontario
K1P 5Y6

INTRODUCTION

[1] This decision deals with a review of patent application 2,188,489 following its rejection in a Final Action.

[2] The Applicant is Union Carbide Chemicals and Plastics Technology LLC. The inventors are David Burns and Rickey Epps and the invention is entitled A COMPOSITION AND METHOD FOR ACID GAS TREATMENT. @

BACKGROUND

[3] The application relates to solvents used in industrial processes in which it is desirable to remove acidic gases, such as carbon dioxide and hydrogen sulfide, from feed gas streams. The feed gas streams may, for example, be employed in the production of ammonia.

[4] The application focuses on the use of particular solvents which are able to absorb acid gas impurities from gas streams. The solvents contain mixtures of dimethyl ethers of polyalkylene glycols of the chemical formula $\text{CH}_3\text{O}(\text{C}_2\text{H}_4\text{O})_x\text{CH}_3$ in which x (referred to as the homolog number, or adduct) can range from about 3 to about 9. While the application relates to mixtures of such compounds, it is the 4-mole homolog (dimethoxytetraethylene glycol, or the dimethyl ether of tetraethylene glycol) and its relative amount in a mixture which are of particular interest in the present case.

PROSECUTION HISTORY

[5] The subject application was filed on October 22, 1996 and a Final Action was issued on July 28, 2003, at which time the application was rejected since all the claims then pending in the application were considered obvious and thus contrary to section 28.3 of the *Patent Act*. The application was also rejected since certain other claims were held to be noncompliant with subsection 87(3) of the *Patent Rules* since they were broader in scope than the parent claim from which they depended.

[6] On January 28, 2004, the Applicant replied to the Final Action and submitted a new set of eight claims. The Applicant argued that the newly submitted claims addressed the objections raised in the Final Action and requested favourable reconsideration. Although the Applicant's amendments and submissions adequately dealt with the defect identified under subsection 87(3) of the *Patent Rules*, in the Examiner's estimation, the Applicant's reply to the Final Action did not overcome the main objection (obviousness) that was raised in the Final Action. The application was therefore referred to the Patent Appeal Board for review.

[7] The Applicant was invited to appear before the Board and provide further submissions at a hearing originally scheduled for May 13, 2009. At the time of the hearing invitation the Board also alerted the Applicant to the Supreme Court decision in *Sanofi-Synthelabo Canada Inc. v. Apotex Inc.*, 2008 SCC 61, 69 C.P.R. (4th) 251 [*Sanofi*] which was handed down after the Final Action was written and after the Applicant had responded thereto. The Applicant was therefore asked to make any submissions it felt were necessary in order to address any effect

that the *Sanofi* decision may have on the obviousness rejection.

[8] At the Applicant's request the hearing was rescheduled for June 29, 2009 at which time the Applicant was represented by Ms. Joy Morrow of the firm Smart & Biggar. Mr. Pierre Cuerrier, the Examiner in charge of the application, and Mr. Terry Diduch, Section Head also appeared at the hearing. At the hearing the Board heard additional oral submissions from the Applicant's representative and was provided with corresponding written submissions.

PROCEDURAL MATTERS

[9] It is apparent from the Final Action that the Examiner's conclusions were based on the test for obviousness set out in *Beloit Canada Ltd. v. Valmet Oy* (1986), 8 C.P.R. (3d) 289 (F.C.A.) [*Beloit*]. As indicated above, after the Final Action was written and after the Applicant had responded thereto, the Supreme Court handed down its decision in *Sanofi* and indicated at paragraph 60 that the restrictiveness with which the *Beloit* test has been interpreted in Canada should be re-examined.

[10] At the hearing the Applicant submitted that it would be premature for the Board to consider the Examiner's rejection and requested that the application be returned to the Examiner for further examination consistent with the statement of law on obviousness as expressed by the Supreme Court in *Sanofi*. In particular, the Applicant submitted that the Examiner neither considered nor relied on the factors set out in *Sanofi*, and that there was a failure to consider whether the invention was self-evident to try with a fair expectation of success. Consequently it was urged that the Examiner might reach a different conclusion in this case, or might maintain his objection but for different reasons. The Applicant submitted that it is unreasonable to require the Applicant to address in detail, before the Board, the factors set out in *Sanofi* in the absence of any information from the Patent Office as to what objections an examiner might make to the claims having regard to *Sanofi*.

[11] In its decision the Supreme Court indicated at paragraph 67 that it will be useful in an obviousness inquiry to follow a four-step approach first outlined in *Windsurfing International Inc. v. Tabur Marine (Great Britain) Ltd.*, [1985] R.P.C. 59 (C.A.) and recently updated by Jacob LJ. in *Pozzoli SpA v. BDMO SA*, [2007] F.S.R. 37, [2007] EWCA Civ 588 [*Pozzoli*]. At the fourth step the Court further indicated that an obvious to try inquiry might be appropriate in areas of endeavour where advances are often won by experimentation (para 68).

[12] Although the *Sanofi* approach is desirable in order to bring better structure to the obviousness inquiry and more objectivity and clarity to the analysis (*Sanofi* at para 67), we note that the correctness of an obviousness decision does not depend upon whether or not the decider has paraphrased the words of the Act in some particular verbal formula (*Sanofi* at para 61, citing *Johns-Manville Corporation's Patent*, [1967] R.P.C. 479 at 493-94) and that the courts have often tended to treat the word formulation of *Beloit* as if it were a statutory prescription that limits the obviousness inquiry (*Sanofi* at para 61). We further note that Jacob LJ., the author of the *Pozzoli* decision, has similarly cautioned against exalting verbal formulations over the fundamental question that the statute itself asks (see *Generics (UK) Ltd v Daiichi Pharmaceutical Co Ltd & Anor* [2009] EWCA Civ 646 at para 17).

[13] Thus an assessment of obviousness based on *Beloit* is not necessarily a reason to immediately conclude that there has been an application of the law that is inconsistent with *Sanofi*. So long as our review is conducted with reference to the same considerations as those identified by the Applicant and the Examiner, but approached with the guidance provided in *Sanofi*, we do not see that the rejected application has been prematurely referred to the Board for review or that there has been, or will be, a misapplication of the law as it is expressed in the Act itself. Furthermore, we note that the Examiner maintained at the hearing that the claimed invention is obvious and we feel that, in the interests of administrative efficiency, the matter should be dealt with now.

ISSUE

[14] Having regard to the claims submitted in response to the Final Action, the Board is faced principally with one question: is the claimed invention obvious?

ANALYSIS

[15] The four-step approach outlined in *Sanofi* entails the following:

- (1) (a) Identify the notional person skilled in the art;
- (b) Identify the relevant common general knowledge of that person;
- (2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it;
- (3) Identify what, if any, differences exist between the matter cited as forming part of the state of the art and the inventive concept of the claim or the claim as construed;
- (4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?

[16] We apply the four-step approach in the following manner.

1(a): Identify the notional person skilled in the art

[17] According to the Final Action the claimed invention would be obvious to the person skilled in the art of acid gas treatment. The Applicant's response to the Final Action does not explicitly define the person skilled in the art and the Applicant's written oral submissions to the Board do not explicitly address the four-step approach. Since defining the person skilled in the art in this case does not appear to be a point of contention, we would simply add to the Examiner's remarks and say that that person would be a chemical engineer familiar with acid gas separation technology and well-known absorption materials used in the context of industrial processes such as ammonia production.

1(b): Identify the relevant common general knowledge of that person

[18] We turn to page one of the specification in order to help us assess the relevant common general knowledge of the person skilled in the art. The first two paragraphs of page one mention a number of United States patents which inform us that, generally speaking, there are two types of solvents, chemical absorbents and physical absorbents, that can be employed in removing acid gas from feed gas streams. From United States patent 4,946,620 issued August 7, 1990 to Kadono et al. we learn that ethers of polyethylene glycol oligomers are widely used as physical absorbents in acid gas treatment technology. From United States patent 4,741,745 issued May 3, 1988 also to Kadano et al. we similarly learn that compositions comprising dimethyl ethers of oligomers with from 2 to 8 ethylene glycol moieties are among the most successful solvents used.

[19] We note that the solvents of Ameen et al. (U.S. patent 3,737,392 B *Ameen*) and Kutsher et al. (U.S. patent 4,581,154 B *Kutsher*) are mentioned in United States patent 4,741,745, and are also discussed in paragraphs 14-16 of the Applicant's written submissions to the Board. In the written submissions the Applicant has acknowledged that polyalkylene glycol dimethyl ethers are known in the gas treatment art as solvents for acid gases such as CO₂, hydrogen sulfide (H₂S) and the like.

[20] *Ameen* discloses a widely-used solvent composition known as SELEXOL^J that consists of a mixture of dimethyl ethers of polyethylene glycol wherein the polyethylene homolog number ranges from 3 to 9 in a bell curve distribution formulated in order to have a viscosity similar to that of water and to have a vapour pressure of less than 0.01 mm Hg. *Kutsher* also refers to SELEXOL^J but proposes an alternative having lower viscosity making it more suitable for use at low temperatures. The *Kutsher* solvent also comprises a bell curve distribution of polyethylene homologs that range from about 3 to about 8 but the distribution is more skewed to the lower homologs.

[21] In sum, we take it that the skilled person would generally know that mixtures of dimethyl ethers of polyethylene glycols, wherein the polyethylene glycol component can range from a homolog number of about 3 to about 9, are suitable for use in absorbing acid gas impurities in natural gas streams. That person would also understand that the viscosity and vapour pressure of such mixtures are dependent on the relative amounts of the polyethylene homologs found therein and that their relative amounts can be tailored as needed.

2: Identify the inventive concept of the claim in question or if that cannot readily be done, construe it

[22] In response to the Final Action the Applicant cancelled the eleven claims on file at the time the Final Action was written and submitted eight new claims. Independent claims 1 and 5 are representative:

1. A solvent composition for removal of acidic gaseous impurities from natural gas, hydrocarbon gas, or syngas streams, consisting essentially of a mixture of dimethyl ethers of polyethylene glycols of the formula $\text{CH}_3\text{O}(\text{C}_2\text{H}_4\text{O})_x\text{CH}_3$ wherein x is from about 3 to about 9 and wherein in at least about 50 weight percent of the total dimethyl ethers x equals 4 and no more than about 15 weight percent of the total dimethyl ethers is a combination of the 3-mole ethoxylate, the 5-mole ethoxylate, and the 6-mole ethoxylate.

5. A composition for removal of acidic gaseous impurities from natural or hydrocarbon gas streams, consisting essentially of a mixture of dimethyl ethers of polyethylene glycols of the formula $\text{CH}_3\text{O}(\text{C}_2\text{H}_4\text{O})_x\text{CH}_3$ wherein x is from about 3 to about 6 and wherein in at least about 40 weight percent of the total dimethyl ethers x equals 4 and no more than about 15 weight percent of the total dimethyl ethers is a combination of the 3-mole ethoxylate, the 5-mole ethoxylate, and the 6-mole ethoxylate.

[23] Claims 2 to 4 and 6 to 7 depend from claims 1 and 5, respectively. Claim 8 is a method claim for removal of gaseous impurities from a gas stream which comprises contacting the stream with a composition as defined in any one of claims 1 to 7.

[24] According to the terms used in claims 1 and 5, the claimed subject matter is a composition, or mixture, of dimethyl ethers of polyethylene glycols which minimally includes about 50 percent of the 4-mole ethoxylate in the case of claim 1 or 40 percent in the case of claim 5. The reference to 40 percent in claim 5 is a typographical error pointed out by the Applicant in their submissions and we accept that, when corrected, it should read 85 percent for agreement with the relative amounts of the remaining components of the composition. The claimed subject matter is a mixture and therefore does not consist of 100% 4-mole ethoxylate; i.e., not the pure dimethyl ether of tetraethylene glycol. The compositions are capable of removing acidic gaseous impurities from natural gas, hydrocarbon gas, or, in the case of claim 1, syngas streams; however, a particular industrial process, application or context is not mentioned in the claims. An acidic gaseous impurity according to the background to the invention, if not understood to a person of skill in the art, can be a gas such as carbon dioxide, hydrogen sulfide, carbonyl sulfides, carbon disulfide, mercaptans and the like.

[25] The inventive concept expressed in claims 1 and 5 is not entirely clear when the claims are taken at face value. That being the case, *Sanofi* (para 77) instructs us that the inventive concept can be better appreciated by reference to the description.

[26] The Background to the Invention suggests that known compositions are problematic since, although generally effective for their intended purpose, they are not optimal. Consequently the description indicates that the invention addresses the need to provide compositions improved in several respects:

[i] It would be desirable to have a gas treatment composition which provides an improved balance of volatility and viscosity, and also improves the removal vs. retention balance of at least one key acidic component of the gas being treated.

[27] The Description of the Invention (starting at page 3, second paragraph) indicates that the invention is based on the unexpected finding that the 4-mole homolog of dimethyl polyethylene

glycol is uniquely effective in absorbing carbon dioxide and also possesses low viscosity and low vapour pressure:

The present invention provides its improvement over the prior art by increasing the concentration of the 4-mole ethoxylate of dimethyl ether present in the solvent being used to treat an acid gas, particularly an acid gas containing carbon dioxide. As will be illustrated in the examples below, it has been unexpectedly found that the 4-mole ethoxylate of dimethyl ether is uniquely effective in retaining carbon dioxide, i.e., in reducing the amount of carbon dioxide exiting the contacting means.

. . .

In accordance with the present invention, it has been discovered that the pure 4-mole ethoxylate of dimethyl ether (i.e., tetraethylene glycol dimethyl ether) has excellent properties for the removal of acid gases, especially CO₂, from methane, natural gas, syngas and hydrocarbon gases in general. Its combination of excellent affinity for the acid gases, low viscosity and low vapor pressure, makes it superior to any of the other homologs in the series for use in acid gas treatment.

[28] The description goes on to indicate that limited amounts of other homologs may be tolerated in the solvents:

Although tetraethylene glycol dimethyl ether is particularly effective as a solvent when used alone, it will be recognized that well-known methods of preparation of dialkyl ethers of alkylene glycols do not ordinarily produce pure products, so as a matter of economic convenience, a certain amount of other homologs may be tolerated in combination with the tetraethylene glycol dimethyl ether. In any such combination, it is preferred that tetraethylene glycol dimethyl

ether be present in a
concentration of at least about
50% by weight, more
preferably at least about 60%,
and most preferably at least
about 80% by weight.

[29] Based on the description we therefore appreciate that the inventive concept expressed in both claim 1 and 5 is the notion of providing an improved acid gas absorbent by preferentially increasing the relative amount of tetraethylene glycol dimethyl ether in solvent mixtures of polyethylene glycol dimethyl ethers. In the case of claim 1, the minimal level of the 4-mole homolog is 50 percent by weight, whereas in the case of claim 5, the minimal level is 85 percent. The invention is based on the purported unexpected discovery that the 4-mole homolog has excellent properties for the removal of acid gases, especially CO₂, and that property, in combination with its low viscosity and low vapour pressure, make it superior to other homologs in the series.

[30] As a matter of economic convenience pure tetraethylene glycol dimethyl ether is not preferred, hence the tolerance of other homologs. This aspect of the invention is reflected in the language of the claims since the claims explicitly allow for the presence of other polyethylene glycol dimethyl ether homologs, principally the 3-, 5- and 6-mole homologs, up to a combined limit of 15 percent. Claim 1 also implicitly accommodates embodiments in which the 7-, 8- and 9-mole homologs are also present in the solvent.

3: Identify what, if any, differences exist between the matter cited as forming part of the state of the art and the inventive concept of the claim or the claim as construed

[31] Two pieces of prior art have been cited in the Final Action: United States patent 2,649,166 issued August 18, 1953 to Porter et al. [*Porter*]; and United States patent 3,362,133 issued January 9, 1968 to Kutsher et al. (referred to in this recommendation as *Kutsher 2* in order to distinguish it from U.S. patent 4,581,154 discussed above under step 1(b) and also issued to Kutsher et al.).

Porter

[32] *Porter* is concerned with finding a solvent that is superior to water in absorbing CO₂ in gaseous mixtures:

An object of the present invention is to provide a simple and efficient method for scrubbing carbon dioxide from gases containing the same with a normally liquid, non-reactive organic solvent.

. . .

A further object of the present invention is to provide a normally liquid, non-reactive organic solvent having relatively high absorption coefficient for carbon dioxide as compared to water together with other properties which make it eminently suitable for scrubbing carbon dioxide from gas mixtures.

[33] Column 3, lines 1-18 indicates the approach taken in selecting the superior solvent:

Of the various solvents tested we have found that the ethers of polyglycols, which are liquid at normal temperature and pressure, have the requisite properties incorporated in (a) to (k) above. Examples of the ethers of polyglycols are as follows:

dimethoxytetraethylene glycol, diethoxytriethylene glycol, dibutoxytriethylene glycol, dibutoxydiethylene glycol, dipropoxytetraethylene glycol, dipropoxytriethylene glycol and dipropoxydiethylene glycol. Such ethers boil within the range of from 200 to 300° C. The preferred solvent is dimethoxytetraethylene glycol ($\text{CH}_3\text{O}[\text{CH}_2\text{CH}_2\text{O}]_4\text{CH}_3$) since it has outstanding properties as compared with water and in addition is available in commercial quantities at a relatively low cost.

[34] *Porter* thus indicates that ethers of polyglycols have the requisite properties incorporated in (a) to (k) above. Those requisite properties include low vapour pressure, low viscosity and high absorption coefficient for carbon dioxide. As such the skilled person reading *Porter* would understand that dimethoxytetraethylene glycol (the 4-homolog of polyethylene glycol dimethyl ether; or more simply the 4-mole homolog) absorbs CO_2 , has low viscosity, has low vapour pressure, and is a solvent preferred over water. It is also apparent that *Porter* tested a number of ethers of polyglycols and that the 4-mole homolog was preferred over the other solvents. Lastly, it is understood that economic realities were considered since *Porter* recognized that the preferred solvent was also available in commercial quantities at a relatively low cost.

[35] The *Porter* solvent was selected from amongst a different or broader group of ethers of polyglycols (i.e., dialkyl ethers of polyalkylene glycols) based on comparisons to water whereas the present invention centres on the selection of the same 4-mole homolog from amongst a more restricted group made up of polyethylene glycol dimethyl ethers (i.e., the group consisting of dimethoxydiethylene glycol, dimethoxytriethylene glycol, dimethoxytetraethylene glycol and so on). In the present case, comparisons were done

amongst members of the more restricted group. The present invention and *Porter* are therefore both focused on the 4-mole homolog but that particular homolog has come into focus for reasons, and through routes, that are not precisely the same.

[36] In the end, an important distinction between *Porter* and claims 1 and 5 is that the claims are directed to mixtures wherein the 4-mole homolog predominates whereas the *Porter* solvent comprises pure 4-mole homolog and has as low an amount of water as practical (less than 5% water).

Kutsher 2

[37] *Kutsher 2* (referred to by the Examiner and Applicant simply as AKutsher®) focuses on a process for selectively removing H₂S from a gas stream which contains both H₂S and CO₂. In the context of that process the patent generally teaches the use of a liquid solvent comprising a normally liquid dialkyl ether or a polyalkylene glycol. Particular steps impart the selectivity to the process and the specification largely deals with those steps. Nonetheless, the patent specification (at column 2, lines 62 to 68) directs the reader to preferentially use the 4-mole homolog and concludes that for all practical purposes® a mixture of homologs is generally® as effective. Thus from *Kutsher 2* the skilled person is again led to the 4-mole homolog, albeit again for reasons different (i.e. differential absorption of acid gases) than those apparent from the present application (i.e. superior acid gas absorption).

[38] Therefore a distinction between claims 1 and 5 and *Kutsher 2* is that the claims are directed to mixtures wherein the 4-mole homolog predominates whereas *Kutsher 2* teaches various possible types of solvents from amongst which a preferred solvent is one that comprises 4-mole homolog alone. A solvent that is effective, for practical purposes, comprises a mixture of the 2- to 7-homologs. The mixture is termed ADMPEG® but its precise makeup is not disclosed.

[39] Each of *Porter* and *Kutsher 2* can also be said to differ from the claimed subject matter in that the claims explicitly allow for the presence of other particular polyethylene glycol dimethyl ether homologs, principally the 3-, 5- and 6-mole homologs, up to a combined limit of 15 percent. Claim 1 also implicitly accommodates embodiments in which the 7-, 8- and 9-mole homologs are present in the solvent.

[40] Lastly, we would comment that it is not clear how the claimed subject matter appreciably differs from the prior art in terms of viscosity and vapour pressure since each prior art reference discloses that the 4-mole homolog is entirely suitable for application in acid gas treatment and since the skilled person understands, if not from the teachings of *Porter* or *Kutsher 2*, then from common general knowledge, that such properties still must be respected when formulating a suitable solvent.

4: Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?

[41] Before answering the ultimate question (i.e., is the invention obvious?) we will first consider the arguments presented by both the Examiner and the Applicant.

The Views of the Examiner

[42] According to the Final Action, the claimed invention is obvious for the following reasons:

. . . it is clear from both references that the dimethyl ether of tetraethylene glycol is preferred among potential polyglycol ethers (Porter et al.) or among potential dimethyl ethers of polyethylene glycol (Kutsher et al.).

While none of the cited references specifically teach the composition (specific amounts of dimethyl ethers of polyethylene glycols) defined in claims 1, 7 and 10 of the present alleged invention, it is submitted that the claimed compositions or the method using such compositions can not be deemed to be inventive. In fact, both cited references recognize the particular effectiveness of tetraethylene glycol dimethyl ether used alone, and Kutsher et al. also recognize its effectiveness when used in combination with a mixture of various homologs. Similarly, the Applicant singles out tetraethylene glycol dimethyl ether as the preferred dialkyl ether of alkylene glycol (A particularly effective as a solvent when used alone®), but points out that other homologs of dimethyl ether of polyalkylene glycol can also be present in limited quantities. However, such a limitation seems to be added for economic convenience and does not yield unexpected results for the removal of acidic gaseous impurities from gas streams. In fact, the Applicant fails to show that, or how, the presence of the 3-mole, 5-mole and 6-mole ethoxylate in the claimed amounts in the composition yields results that are superior than when using the 4-mole ethoxylate alone. The Applicant even seems to suggest (on page 4, 2nd paragraph)

that the presence of the 3-mole, 5-mole and 6-mole ethoxylate would actually yield worse results. Therefore, in view of the lack of any superlative results, the applicant cannot lay claim to a *selection* invention based on the specific amounts outlined in the present claims.

[43] From this we take it that the invention is viewed as obvious since the prior art teaches the selection of the same preferred subject matter of the claims, namely the 4-mole homolog, and since the specification does not indicate that the inclusion of other homologs in an acid gas absorbing composition is inventive in the sense of yielding an unexpected result. The selection of other parameters in the claims, i.e. the amounts of the other homologs, are therefore not considered inventive since they fail to define a patentable selection.

The Applicant's Response to the Final Action and the Applicant's Further Submissions

[44] In response to the Final Action the Applicant submitted that:

Nowhere in [Porter] and [Kutsher 2] is found any disclosure or suggestion of the use of the specific mixture of tetraethylene glycol dimethyl ether homologs claimed in the present application. A person of an ordinary skill in the art (knowing the teachings of the above-mentioned two references) would not be motivated to use specific mixture of tetraethylene glycol dimethyl ether homologs claimed in the present application. A person of an ordinary skill in the art would not have expected to achieve an improved balance of volatility and viscosity, as well as an improvement in the removal versus retention balance of at least one key acidic component of the gas being treated, by using the specific mixture of tetraethylene glycol dimethyl ether homologs claimed in the present application. Without long and tedious experimentation, and without the hindsight knowledge of the present invention, a person of an ordinary skill in the art would not know what specific combination of the homologs would produce the desired advantages achieved in the present invention.

[45] Through these arguments the Applicant draws our attention to the recitation of *specific* mixtures in the claims.

[46] We further note that the Applicant has argued along the following lines: that the prior art would not motivate the skilled person to use the specifically claimed invention, and that long and tedious experimentation by a person of skill in the art would have been required in order to realize an unexpected technical effect. In support of the latter, the Applicant provided comparative test data showing that solvent compositions according to the present invention have carbon dioxide removal capabilities that are similar to that of pure tetraethylene glycol dimethyl ether and that are superior to mixtures of polyethylene glycol dimethyl ethers that do not fall

within the scope of the claims.

[47] The Applicant has further argued that the present invention does not require the same amount of purification and is therefore less expensive and requires less effort to prepare. These things are characterized by the Applicant as unexpected economic and procedural advantages.

[48] In the written submissions provided to the Board, the Applicant went on to argue that each prior art reference was considerably old and that each taught something different than what is presently claimed. Concerning *Porter*, the Applicant pointed out at paragraph 19 in the written submissions provided to the Board that:

It is apparent from a review of the entire patent that the 4-homolog of polyethylene glycol is being compared to water and not to any other of the polyethylene glycols mentioned therein. It is also apparent that the 4-homolog is used to exemplify the invention taught in the Porter patent at least because the two-above mentioned properties [that it has outstanding properties compared to water and that it is available in commercial quantities]. It is not apparent from the patent that the 4-homolog is preferred for any other reason(s). Thus it is not suggested by the Porter patent, and cannot be concluded therefrom that the 4-homolog is preferred over any other homolog of polyethylene glycol dimethyl ether for use as a solvent to remove CO₂ from a gas stream. [emphasis in original]

[49] The Applicant also noted that *Porter* reported on the solubility of CO₂ in the 4-homolog of polyethylene glycol as compared to water B no data was provided comparing CO₂ solubility in water and any other homolog or in any mixture of homologs. The 4-homolog therefore was selected because it was considered superior to water and because it was readily available and not, as suggested in the Final Action, because the 4-homolog was superior over other polyethylene glycol dialkyl ether homologs.

[50] Concerning *Kutsher 2*, the Applicant's written submissions to the Board state, in part, the following:

Thus, the Kutsher patent teaches the parameters for selectively removing H₂S from a gas stream. It does not teach or suggest optimizing the removal of acidic gas impurities generally from a gas stream. Nor does it teach or suggest the relative amounts of specific polyethylene glycol dimethyl ethers which are useful to improve solubility of acidic gas impurities generally or CO₂ in particular.

The Kutsher patent teaches the use as solvent of any polyethylene glycol dialkyl ether that remains liquid under the conditions of the process, either individually or in admixture. Tetraethylene glycol dimethyl ether (i.e. the 4-homolog) is preferably used, but the patent specifically states that a mixture of the 2-homolog to the 7-homolog is generally as effective for all practical purposes.

The Kutsher patent does not teach or suggest any advantage of a mixture having at least 50% of the 4-homolog and less than 15% of the 3-, 5- and 6-homologs combined whether for removal from a gas stream of acidic gases generally, or H₂S or CO₂ in particular.

[51] From these comments we take it that the Applicant views the claimed invention as differing from *Kutsher 2* since *Kutsher 2* does not teach or suggest optimizing the removal of gas impurities, the relative amounts of specific polyethylene glycol dimethyl ethers or the advantages realized by the claimed invention.

Is the Claimed Invention Obvious?

[52] The fourth step of the four-step approach set out in *Sanofi* embodies the statutory question and asks whether the differences between the matter cited as forming part of the state of the art and the inventive concept of the claim, or the claim as construed, constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention.

[53] Setting aside for the time being the question of whether the present invention was obvious to try, we have formed the opinion that the claimed invention is obvious. In our view, considered from the standpoint of a person skilled in the art, to go from the prior art situation in which a solvent composition is preferably formulated to contain pure 4-mole homolog to a situation in which a solvent composition is formulated such that the 4-mole homolog vastly predominates (as claimed) constitutes a step which would have been obvious to the skilled person. The prior art clearly teaches the selection, or preference, of the 4-mole homolog as a solvent component and a critical difference between the prior art and the claimed subject matter is the explicit recitation of other homologs within certain tolerances.

[54] While the claims do explicitly refer to specific limits or amounts of various other homologs, they are not limited to a singular specific mixture, they encompass a broad range of embodiments

in all of which the 4-mole homolog substantially predominates. We therefore disagree with the notion, as suggested by the Applicant, that the claims relate to specific mixtures precisely formulated with defined amounts of other homologs.

[55] In our view it is important to bear in mind the scope of the claims and that the inventive concept resident therein applies to all embodiments (*Brugger v. Medic Aid Ltd.*, [1996] R.P.C. 635 at 656 [*Brugger*]). Even if we have misjudged or have been distracted by what we consider to be the inventive concept expressed in the claims, and accept an assertion that specific mixtures were precisely formulated to contain defined amounts of other homologs, then we would say that by simply construing the claims, as step 2 of the *Sanofi* approach proposes as an alternative to determining the inventive concept, we would still find them obvious. We find nothing unresolvably ambiguous in the claims and, although the tolerances specified in the claims set limits on their scope, we do not believe that it is a requirement that the prior art lead the skilled person to select precisely those same limits in order for that person to find at least some of the claimed subject matter obvious. As noted in *Brugger* (at p.657):

After all, *Windsurfing* was only putting forward a convenient way of approaching the statutory question; *is anything* falling within the scope of the claims obvious?@.

[56] Thus, finding that a single embodiment falling within the scope of the claims is obvious is sufficient.

[57] According to the terms of the claims an embodiment can simply be, for example, one in which the 4-mole homolog constitutes an overwhelming proportion of the solvent, e.g., relatively impure tetraethylene glycol dimethyl ether which carries with it relatively minor amounts of other homologs such as the 3-, 5- and 6- mole homologs. We neither believe that prolonged and arduous experimentation is required on the part of the skilled person in order to vary the preferred solvents of *Porter* or *Kutsher 2* in order to arrive at a solvent falling within the scope of the claims nor do we believe that the prior art dispossesses the skilled person of motivation to produce such a solvent since *Kutsher 2* and *Porter* each teaches that person to be practically minded and to be considerate of economic realities.

[58] Though the inclusion of other homologs in the claimed solvents would understandably and arguably result in a more economical product, we are not persuaded that their inclusion yields anything that the skilled person would not expect in terms of technical performance.

[59] The skilled person would understand from *Kutsher 2* that the 4-mole homolog alone is preferable but would, nonetheless, appreciate that solvent mixtures in which the 4-mole homolog was varied could still be used in the process disclosed by *Kutsher 2*. Although *Kutsher 2* does not place the same precise limits on the amounts of other homologs that may be tolerated, the inclusion of other homologs in the solvent is clearly contemplated for reasons of practicality. *Porter* similarly indicates that the 4-mole homolog is preferred in their application. *Porter* also indicates that economic and practical realities were considered since the preferred solvent was available in commercial quantities at a relatively low cost yet those considerations followed after the selection of the 4-mole homolog had already been made.

[60] The references in the claims to the presence of other homologs are features which reflect practical economic considerations rather than features selected with a view to improving the technical performance of the claimed solvents. While it is not inconceivable that including features in a claim for economic or procedural reasons can be inventive, again we are not persuaded that their inclusion, or tolerance, is something which would not have been apparent to the skilled person. In our estimation the skilled person would have known and expected that with practical considerations, as taught by *Kutsher 2* and *Porter*, come economic and procedural advantages. In that regard we note that, if not previously understood by the skilled person, the specification also admits that well-known methods of preparation of dialkyl ethers of alkylene glycols do not ordinarily produce pure products. It would logically follow that the skilled person, being practically minded, would readily appreciate that, for example, relatively impure tetraethylene glycol dimethyl ether could be used as an acid-gas absorbent without the need for purifying it any further and that the avoidance of unnecessary steps would be less expensive and more efficient.

Is the Invention Obvious to Try?

[61] In acknowledgement of the Supreme Court's decision in *Sanofi*, the Applicant also addressed the question of whether the invention was obvious to try. And so shall we even though the Examiner indicated at the hearing that he felt the obvious to try test did not seem to apply.

[62] In *Sanofi*, the Supreme Court indicated that an obvious to try test may be appropriate in areas of endeavour where advances are often won by experimentation (para 68). Although the test is not mandatory (*Sanofi*, para 62), and it may be arguable that the present case does not warrant such test, we do not consider it necessary to dwell on the point and will address the obvious to try test for the sake of completeness even though we believe, as outlined above, that the statutory question has already been answered.

[63] When considering whether an invention would have been obvious to try, the Supreme Court indicated that the following factors should be taken into consideration (at para 69):

- (1) Is it more or less self-evident that what is being tried ought to work? Are there a finite number of identified predictable solutions known to persons skilled in the art?
- (2) What is the extent, nature and amount of effort required to achieve the invention? Are routine trials carried out or is the experimentation prolonged and arduous, such that the trials would not be considered routine?
- (3) Is there a motive provided in the prior art to find the solution the patent addresses?

[64] In considering this test, the Applicant first drew the Board's attention to two recent decisions (*Apotex Inc. v. Pfizer Canada Inc. et al.*, 2009 FCA 8 and *Pfizer Canada Inc. et al. v. Novopharm Ltd. et al.*, 2009 FC 638) which clarified that the obvious to try test centred on whether it was more or less self-evident to try to obtain the invention, as opposed to trying with the mere possibility of success.

[65] The Applicant then put forward several arguments as to why the invention was not more or less self-evident to try. Concerning *Porter*, the Applicant stated:

The cited prior art (the Porter patent) establishes that tetraethylene glycol dimethyl ether in a solvent having low water content is useful for removing acidic gases (such as CO₂) from a gas stream. This may suggest that tetraethylene glycol dimethyl ether might usefully be further investigated to determine whether it is *per se* efficacious for removing acidic gases from a gas stream, whether it remains substantially equally efficacious when in mixtures with other polyethylene glycols, and if so the compositions of such mixtures. However, a solvent composition having at least 50% of the 4-homolog and no more than 15% of the 3-, 5-, and 6-homolog combined, as claimed in the application, cannot be said to be more or less self-evident from the teachings of the Porter patent.

[66] Concerning *Kutsher 2* the Applicant stated:

Moreover, while the cited prior art (the Kutsher patent) teaches that mixtures of polyethylene glycol dimethyl ethers are useful for selectively separating H₂S from acidic gas impurities in a gas stream, this patent does not even suggest, let alone establish as more or less self-evident, that a solvent composition having the claimed components in their claimed ratios would be efficacious for separating acid gases from a gas stream in general, and more particularly for separating CO₂ from a gas stream.

[67] The Applicant concluded their submissions by addressing the three obvious to try factors outlined in *Sanofi*. Regarding the first factor, the Applicant submitted that it cannot be said that it is self-evident that the claimed mixture ought to have the desired effect of providing a gas treatment composition having the advantages taught by the Applicant. This we take to mean that, according to the Applicant, the advantages realized by the claimed compositions would not have been self-evident from the prior art. Further, the Applicant says that the Examiner has not suggested that there are a finite number of identified predictable solutions to the problem

identified by the Applicant since the prior art addresses different problems than that of the Applicant:

As to the first factor stated by the Supreme Court, Applicant submits that it cannot be said to be self-evident that the mixture claimed by the Applicant ought to have the desired effect of providing a gas treatment composition having the advantages taught by Applicant (see disclosure page 1 of the application), namely a solvent for acidic gas which has an improved balance of volatility and viscosity and an improved removal versus retention balance of at least one key acidic component (*eg* CO₂) of the gas being treated, as compared with known solvent compositions. Nowhere in the prior art is it suggested that a mixture enriched in the 4-homolog of polyethylene glycol to at least 50% with a consequent maximum concentration of the 3-, 5- and 6-homologs of 15% would have these stated desired advantages, nor does the Examiner suggest that such is self-evident from the prior art.

Further with respect to the first factor, the Examiner has not suggested that there are a finite number of identified predictable solutions to the problem identified by Applicant, and which are known to persons skilled in the art. Indeed, the solutions identified by the prior art address different problems than the one addressed by the Applicant. The Porter patent addresses the problem of water content in the solvent, and its discussion of polyethylene glycol dimethyl ether solvents is in that context. The Kutsher patent addresses the problem of the selective removal of H₂S gas, and its discussion of mixtures of polyethylene glycol dimethyl ethers is in that context. Applicant is not concerned with either of those problems. Rather, Applicant is concerned with modifying the solvent used to remove impurities from a gas stream in a fashion which improves the balance between volatility and viscosity of the solvent and which improves the balance between removal and retention of at least one key acidic component in the gas stream.

Thus solving the problem identified by the Applicant cannot not be more or less self-evident from the cited prior art, since the prior art addresses different problems in the gas treatment art.

[68] Regarding the second factor, the Applicant again points out that the prior art is quite old, dating to 40 and 25 years prior to the filing of the present application. From this the Applicant infers that it was not a straightforward or simple matter to arrive at the claimed invention.

[69] Concerning the third obvious to try factor, the Applicant has argued that there is no motive provided by the prior art for one skilled in the art to obtain the composition specified by the Applicant.

The third factor set out by the Court, is whether the prior art provides a motive to find the solution addressed by the claims of the application. The prior art does not suggest what mixture of the different polyethylene glycol dimethyl ether homologs should be used most effectively for removing acidic gas impurities from a gas stream or more particularly for removing CO₂ from a gas stream. There is no motive provided by the prior art for one skilled in the art to obtain the composition by the Applicant. If there was, then such a person would have developed and sold it many years earlier, particularly as other mixtures were known having similar homolog components in different ratios, *eg* SELEXOL as mentioned in paragraph 16 above.

[70] Ultimately the Applicant submitted that although the prior art establishes that the 4-mole homolog is useful in removing acid gases, and even though this may suggest that the 4-mole homolog might warrant further investigation to determine whether it remains efficacious in mixtures, the cited prior art patents do not make it obvious to try the solvent compositions having the claimed components in their claimed ratios for improving the separation of acidic gases from a gas stream:

Thus, although the cited patents may establish that tetraethylene glycol dimethyl ether is useful for removing acidic gases (such as CO₂) from gaseous mixtures, and even though such may suggest that tetraethylene glycol dimethyl ether might usefully be further investigated to determine whether it remains substantially equally efficacious in mixtures and if so the compositions of such mixtures, the cited patents do not make it obvious to try the solvent composition having the claimed components in their claimed ratios for improving the separation of acidic gases from a gas stream in general, and more particularly for separating CO₂ from a gas stream.

[71] Of particular relevance to the first and second of the obvious to try factors, the Applicant has said that the circumstances under which the present invention arose (the selection of the 4-mole homolog from amongst a series of polyethylene glycol dimethyl ethers) and the particular problem the present inventors had in mind (obtaining a solvent composition with optimal properties) are important considerations. The Applicant also says that the prior art does not suggest the advantages realized by the claimed invention nor would they have been self-evident and further states that the problem identified by the Applicant cannot be more or less self-evident from the cited prior art, since the prior art addresses different problems in the gas treatment art. However, we do not understand the obvious to try test to necessarily require that the same particular advantages realized by the invention, or the very same problem addressed by the inventors, to be more or less self-evident. According to the Supreme Court (*Sanofi* at para 66):

For a finding that an invention was obvious to try, there must be evidence to convince a judge on a balance of probabilities that it was more or less self-evident to try to obtain the invention. Mere possibility that something might turn up is not enough. [emphasis added]

[72] As the Applicant has noted, the Federal Court of Appeal in *Apotex Inc. v. Pfizer Canada Inc. et al.*, 2009 FCA 8 at para 29 indicated that the invention must be more or less self-evident. Thus the focus of the analysis is on the claimed invention itself and not necessarily on identifying the very same advantages which the inventor believes accrue from its implementation. A proper finding of obviousness can be made notwithstanding evidence of certain advantages if that finding proceeds upon a suggestion that the invention is obvious for reasons unrelated to the alleged advantages which are said to be obtained (*Degussa-Huls SA v. The Comptroller General of Patents*, [2005] R.P.C. 29 at para 29).

[73] In the present situation, the Applicant has come to the same realization as *Kutsher 2* and *Porter* and found that the 4-mole homolog would work as an acid gas absorbent and that it is in fact preferable for that application but has come to that realization in a context that is not precisely the same. Nonetheless, *Kutsher 2*, *Porter* and the present invention are all clearly concerned with acid-gas absorption technology whether that be principally in relation to a removal process or in relation to solvents used therein. Each party has realized their own perceived advantage, again albeit in different contexts. In our estimation the prior art makes it clear to the skilled person that solutions of the 4-mole homolog, as well as variations thereof, ought to work in a predictable manner as acid gas absorbents and that certain advantages would be realized.

[74] The particular context of use of the solvents of the present invention, or the manner in which the present inventors came to the realization that they may be superior for their purposes, does not necessarily mean that they are inventive when viewed from the perspective of the skilled person taking into account *Kutsher 2* or *Porter*. That is to say, when viewed without any knowledge of the alleged invention as claimed the prior art indicates that known solvent compositions which do not fall within the scope of the claims, such as one comprising pure 4-mole homolog, may be varied in an obvious manner so as to obtain a composition that does fall within the scope of the claims. We believe that the skilled person would have been motivated by commercial and practical realities to adopt an obvious variant of a known composition and thereby obtain an embodiment falling within the scope of the claims and would have done so with more than the mere possibility of success.

[75] Considering the second factor and the submission that a considerable amount of time passed between the publication dates of the prior art references and the filing of the present application, we note that according to *Brugger (supra, at p. 653)* the age of the prior art is not necessarily a determining factor:

The fact that a document is old does not, per se, mean that it cannot be a basis for an obviousness attack. On the contrary, if a development of established and ageing art is or would be obvious to the skilled worker employed by a hungry new employer, it cannot be the subject of valid patent protection even if those who have been in the trade for some time, through complacency or for other reasons, have not taken that step. Each pleaded piece of prior art must therefore be assessed as if it was being considered afresh at the priority date. It is not to be excluded from this exercise merely because it is old. There is no rule of commerce that every new product or process must be developed and put on the market or published in literature as soon as it becomes obvious. That is not a sensible or realistic expectation. There is an infinite number of things which are obvious to do or make but they are not all done or made instantly. Most will never be.

[76] Although the age of the prior art may be relevant to an obviousness inquiry, in the present case, a more relevant consideration is the wording of the second factor itself, *viz.* "What is the extent, nature and amount of effort required to achieve the invention?" Regarding this aspect, there does not appear to be anything that suggests that, in order to achieve an embodiment falling within the scope of the claims, prolonged or arduous experimentation is required. Varying a known composition to contain other homologs, in relatively minor amounts and within the tolerances of the claims, would not constitute an undue burden.

[77] Concerning the third factor of the obvious to try test, the Applicant has again suggested that, because of the age of the prior art, there is no motive provided by the prior art. If there was, then the skilled person would have developed and sold improved compositions falling within the scope of the claims many years earlier, particularly since other mixtures, e.g. SELEXOL_J, of similar homolog components were already known. While it is true that SELEXOL_J is a well-known and has apparently been widely used commercially for many years, it does not necessarily follow that improvements over it of the type presently claimed are nonobvious. Although asking the question "Why was the invention not made before?" can be relevant to an obviousness inquiry, we note, as was concluded in *Brugger* (at p. 655), that:

The fact, if it be one, that existing commercial products are highly successful and satisfactory does not indicate that there are no obvious modifications to make to them. It merely demonstrates that there may be little incentive to those already making those products to change the design - a quite different matter.

On the facts of this case, a skilled but un inventive man in the art who was presented with the core pieces of prior art would not have assumed that, because of their age, there were no valuable modifications worth trying out.

[78] Likewise in the present case we are not convinced that the age of the prior art or the longstanding existence of a satisfactory solvent composition means that the skilled person would not be motivated, to any degree, to seek improvements or modifications. In the present case we see that the skilled person would possess at least some incentive, as explained previously, to adopt obvious variations of compositions taught in the prior art in view of economic and/or practical realities. It would also have been clear to the skilled person, based on the common general knowledge (see para 21 above), that the task of varying known solvents, including SELEXOL_J, would not represent a significant disincentive.

[79] We therefore consider the claimed invention obvious even when viewed in the context of the obvious to try test.

CONCLUSIONS

[80] For all the foregoing reasons we find that the invention claimed in claims 1 and 5 is obvious. This finding also extends to dependent claims 2 to 4 which, although narrower in scope, do not recite features that would necessitate a different analysis or rationale. The same is true of claim 8 which, although drafted in method form, merely recites a method of using a solvent composition as defined in any one of claims 1 to 7. We further note that neither the Examiner nor the Applicant has suggested that patentable distinctions reside in either the dependent claims or the method claim.

[81] Having found that claim 5 is obvious we do not consider it necessary to deal with the ambiguity introduced into claim 5 as a result of the amendments submitted in response to the Final Action. Had we concluded otherwise we would accept that the reference to 40 percent in claim 5 is a typographical error which, when corrected, should read 85 percent such that it accords with the relative amounts of the remaining components of the composition.

PROPOSED CLAIMS

[82] At the conclusion of the hearing the Applicant provided the Board with three alternative claim sets; one of which might conceivably be entered into the application upon direction from the Commissioner in accordance with subsection 31(c) of the *Patent Rules*.

[83] The first proposed claim set would correct the ambiguity in claim 5, and the second and third sets were proposed in the eventuality that the Board reached an unfavourable decision on the claim set under review. The second proposed claim set mirrors the claim set under review except that the product claims restrict the Acidic gaseous impurities to carbon dioxide and the method claim specifies that at least 25% of the carbon dioxide is removed from the gas stream.

[84] The third proposed claim set consists of one independent method claim and four dependent claims. The methods outlined in these claims basically calls for the addition of a solvent having a high concentration of the 4-mole homolog to a Pre-existing solvent comprising a mixture of alkylene oxides including at least some of the 4-mole homolog with the result that the concentration of the 4-mole homolog is increased to at least 50% thereby reducing carbon dioxide in a gas stream by at least 25%.

[85] The first proposed claim set merely corrects a typographical error B something that would not render the claimed subject matter inventive for the reasons previously outlined. In our opinion the same is true of the amendments reflected in the second proposed claim set since the limitation of the acid gas to carbon dioxide is not a limitation sufficient to patently distinguish the claims over the prior art.

[86] Regarding the third proposed claim set, we note that method claims similar to these were

present throughout prosecution but were not pursued in response to the Final Action. On the question of obviousness, no distinction was made either by the Examiner or the Applicant between the method claims and product claims.

[87] While subsection 31(c) of the *Patent Rules* does allow the Commissioner to direct the Applicant to make certain claim amendments to bring the application into conformance with the Act or Rules, that subsection neither permits the Applicant, as a matter of right, to amend claims after the time limit to respond to a Final Action has lapsed nor does it oblige either the Board or the Commissioner to consider and analyze proposed claim amendments that may or may not bring the application into conformance.

[88] We therefore decline to further consider any of the proposed claim amendments and would not recommend that the Applicant be required to submit any of them.

RECOMMENDATION

[89] In summary, the Board concludes that the claims on file are obvious contrary to section 28.3 of the *Patent Act* and we therefore recommend that the application be refused.

Ed MacLaurin	Mark Couture	Ryan Jaecques
Member	Member	Member

COMMISSIONER'S DECISION

[90] I concur with the Patent Appeal Board's findings that the claims on file are obvious under section 28.3 of the *Patent Act*.

[91] Accordingly, I refuse to grant a patent on this application. Under section 41 of the *Patent Act*, the Applicant has six months within which to appeal my decision to the Federal Court of Canada.

Mary Carman
Commissioner of Patents

Dated at Gatineau, Quebec
this 20th day of July, 2010