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**D E C I S I O N**  
of 1 April 2004

**Case Number:** T 1087/00 - 3.3.6

**Application Number:** 94106422.2

**Publication Number:** 0622446

**IPC:** C11B 3/00

**Language of the proceedings:** EN

**Title of invention:**  
Process for refining oil and fat

**Patentee:**  
Showa Sangyo Co., Ltd.

**Opponents:**  
mg technologies ag  
AB Enzymes GmbH

**Headword:**  
Refining process/SHOWA

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
"Inventive step (no): the skilled person aiming at improving the efficiency of a process based on a specific reaction would search for a solution to this problem in any prior art process based on this reaction belonging to the relevant technical field"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 1087/00 - 3.3.6

**DECISION**  
of the Technical Board of Appeal 3.3.6  
of 1 April 2004

**Appellant:** Showa Sangyo Co., Ltd.  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 1 September 2000  
revoking European patent No. 0622446 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** L. Li Voti  
**Members:** P. Ammendola  
U. J. Tronser

## Summary of Facts and Submissions

I. This appeal is from the decision of the Opposition Division revoking European patent No. 0 622 446 concerning a process for refining oil and fat.

II. Respondents I and II (Opponents I and II) sought revocation of the patent for lack of novelty and inventive step (Article 100(a) in combination with Articles 52(1), 54 and 56 EPC). They cited *inter alia* in support of the oppositions

Document (1) = English translation of JP-A-02 153 997

and

Document (2) = EP-A-0 513 709.

III. In its decision, the Opposition Division found that the patented process was anticipated by Document (1) while that defined in the only auxiliary request was obvious in view of the prior art disclosed in Documents (1) and (2).

IV. The Appellant (Patent Proprietor) filed an appeal against this decision.

It enclosed an experimental report (hereinafter "Document 9") to the statement setting out the grounds of appeal.

Under cover of a letter dated 1 March 2004 it filed *inter alia* an amended set of 6 claims labelled as "auxiliary request II" and

Document (11) = Abstract of "Irreversible lysozyme inactivation and aggregation induced by stirring: kinetic study and aggregates characterization", S.Colombiè et al., Biotechnology Letters, vol. 22(4), pages 277 to 283, February 2000.

V. At the oral proceedings held before the Board, the Appellant withdrew all preceding requests with the exception of the auxiliary request II.

VI. Claim 1 of the auxiliary request II reads

"1. *A process for refining oil and fat containing about 100 to 10,000 ppm of phospholipids which comprises:*  
*reacting, in an emulsified condition, said oil and fat with an enzyme having activity to decompose glycerol-fatty acid ester bonds in glycerophospholipids, wherein said emulsified condition is a condition, in which oil and fat is dispersed in an aqueous dispersion medium in form of fine particles having an average particle size of from 0.1 to 50  $\mu$ m and is formed by an emulsifier, such as a high speed mixer, using 30 to 200 weight parts of water per 100 weight parts of said oil and fat, and separating the treated oil and fat from the decomposed phospholipids present in the emulsified condition."*

The remaining claims 2 to 6 of this request define further embodiments of the process of claim 1.

VII. As regards inventive step, the Appellant argued in writing and orally as follows.

The claimed process differed from the preferred method of Document (1) wherein the oil or fat is treated with **relatively large amounts of enzyme solution** (hereafter indicated as "LAES process") in that the former would require the use of a high-speed mixer and the formation of a dispersion of oil particles having smaller size.

The experimental report labelled Document (9) would demonstrate that the enzyme solution recovered from the claimed process maintained a higher enzymatic activity and, thus, that this solution could be recycled to more purification steps than in the prior art process of Document (2). The Appellant conceded that the wording used in the experimental report resulted in some obscurities, but argued that they derived from errors of translation, whose correction was self-evident.

The person skilled in the art aiming at reducing the amount of waste water upon repetition of the refining step - i.e. aiming at increasing the number of refining steps to which the same enzyme solution may be recycled - would not consider relevant Document (2), since this citation was totally silent as to this technical problem and referred only to refining processes wherein the amount of oil or fat was much larger than that of the aqueous phase, so as to form a water-in-oil emulsion (and not an oil-in-water emulsion as in the LAES process of Document (1)).

Moreover, the person skilled in the art would have expected that the application of the turbulent mixing disclosed in Document (2) to the process of Document (1) could result in deactivation of the enzyme, as shown in Document (11).

Finally, Document (2) would at most suggest that the reaction between the enzyme and the phospholipids is promoted by the use of turbulent mixing in combination with the addition of a surfactant (whereas no surfactant is required in the patent in suit) and by reducing the dispersed oil or fat to the finest possible particle size (whereas claim 1 of the auxiliary request II requires a particle size from 0.1 to 50  $\mu\text{m}$ ). Therefore, an arbitrary combination of the teachings in Documents (1) and (2) would not lead to a process as claimed in the patent in suit.

VIII. Respondent I filed no comment with regard to the patentability of the Appellant's auxiliary request II.

Respondent II instead argued as regards inventive step of this request, that Document (1) also mentioned the possibility of recycling the used enzyme solution of the LAES process and that it was obvious for the skilled person to increase the mixing speed in the LAES process of example 3 of this citation, in order to promote further the enzymatic reaction, since the beneficial effect of this measure on this reaction was disclosed in Document (2).

IX. At the oral proceedings held before the Board on 1 April 2004, the Appellant requested that the decision under appeal be set aside and that the patent be

maintained in amended form on the basis of claims 1 to 6 of the request submitted under cover of the letter dated 1 March 2004 (indicated as auxiliary request II).

- X. As announced in the letter dated 9 December 2003 Respondent (I) was not represented at the hearing.
- XI. Respondent II, who attended the oral proceedings, requested that the appeal be dismissed.

### **Reasons for the Decision**

#### *Auxiliary request II (Appellant's only request)*

- 1. *Allowability in view of the requirements of Articles 84 and 123 and Rule 57(a) EPC; novelty of the claimed subject-matter (Article 100(a) in combination with Articles 52(1) and 54 EPC)*
  - 1.1 The Board is satisfied that the claims of the Appellant's request comply with the requirements of Articles 84 and 123 and Rule 57(a) EPC and that their subject-matter is novel (Article 100(a) in combination with Articles 52(1) and 54 EPC).
  - 1.2 No reason need to be given in respect of these findings, since, as explained in the following point, this request is not allowable on other grounds.
- 2. *Inventive step assessment for the subject-matter of claim 1 (Article 100(a) in combination with Articles 52(1) and 56 EPC)*

2.1 Claim 1 defines a process for refining oil and fat containing phospholipids. In the claimed process 100 weight parts of oil or fat are treated in emulsified form with 30 to 200 weight parts of water and with an enzyme capable of decomposing the glycerol-fatty acid ester bonds, whereby the oil or fat is dispersed in the aqueous medium in the form of particles having an average size of from 0.1 to 50  $\mu\text{m}$ .

2.2 The technical problem addressed in the patent in suit is to provide a process for refining oil and fat that is **very efficient in decomposing and removing undesired phospholipids**, so that it is possible to achieve a satisfactory oil and fat quality with reduced enzyme cost and saving of water (see page 2, from lines 50 to 57 of the patent in suit). In addition, the patent discloses explicitly that the saving in the amount of water (upon repetition of the process) is also achieved by recycling the diluted enzyme solution (see page 3, lines 34 to 41).

2.3 Relevant prior art

2.3.1 The Board notes that the same technical problem is addressed in Document (1) (see page 3, last paragraph to page 4, line 7) which considers several alternatives for solving it. Moreover, Document (1) was also considered relevant background art by the inventors of the patent in suit (see the published patent application EP-A-0622 446, page 2, line 36, comparative example 2 and page 6, lines 40 to 42).

Therefore, the Board sees no reason to deviate from the finding of the Opposition Division that the prior art



disclosed in this citation represents an appropriate starting point for the assessment of inventive step.

This conclusion has not been disputed by the parties.

- 2.3.2 In particular, Document (1) discloses a LAES process (see page 5, lines 6 to 8 and from page 5, line 23 to page 6 line 1, as well as example 3) which allows the rapid reduction of the level in phospholipids using low enzyme amounts and mentions also the possibility of recycling the recovered enzyme solution (see page 9, lines 3 to 8). This citation is however silent as to the size of the oil and fat particles formed during the reaction under mixing.

Therefore, the Board concurs with the decision under appeal (see item 7 of the reasons) that the claimed subject-matter differs from the relevant prior art represented by the LAES process of Document (1) only in that the latter does not disclose directly and unambiguously the formation of an emulsion state wherein the particle size of the dispersed oil phase is between 0.1 and 50  $\mu\text{m}$ .

- 2.3.3 The Appellant has alleged that the claimed process is further distinguished from that disclosed in Document (1) in that it requires mixing at "high speed".

The Board cannot accept this argument, since the expression "*such as a high speed mixer*" in claim 1 indicates the possibility of using an apparatus operating at high mixing speed as one of the possible options and the patent specification indicates as suitable emulsifiers also apparatuses whose operating

parameters cannot possibly be described in terms of (either high or low) mixing "speed" (see page 3, lines 26 to 29, of the patent in suit, citing among the preferred emulsifiers e.g. "an ultrasonic dispersion apparatus", "a vibrator", "a membrane emulsifying apparatus" etc.).

Therefore, the Board concludes that the use of high speed mixing is not a feature distinguishing the claimed process from the LAES process of Document (1).

## 2.4 Technical problem

2.4.1 In the light of the description referring to the disadvantages of Document (1) (see the patent in suit page 2, lines 46 to 47, and page 6, lines 26 to 28 clearly referring to the experimental comparison among the data in Table 1), it is apparent from the patent in suit that the claimed process is superior in terms of **efficiency of the enzyme reaction** to the LAES process of this prior art (in the self-evident sense that it allows the reduction of the residual phospholipids content to a desired value either within a shorter treatment time and/or by using less enzyme).

Therefore, the technical problem explicitly addressed in the patent in suit (see above point 2.2) must be seen vis-à-vis the LAES process of Document (1) as that of **improving the efficiency of the enzyme reaction of this prior art.**

Since the Respondents have failed to provide any experimental comparison or other evidence that would demonstrate the contrary, the Board has no reason to

doubt that this technical problem has actually been solved by the process of claim 1.

- 2.4.2 The Appellant has alleged that the enzyme solution recovered from the claimed process was recyclable to more refining steps (i.e. had higher enzymatic activity) than that recovered from the process of Document (2). It maintained, therefore, that also this technical advantage should be taken into account in the assessment of inventive step.
- 2.4.3 For demonstrating the allegedly higher activity of the enzyme solution recovered from the process of the patent in suit the Appellant relied substantially on the experimental report labelled as Document (9) (see in particular the values reported for the "reaction oil" in Table 3). It maintained that this report would allow comparing the number of oil purification steps to which the same enzyme solution of the claimed process can be satisfactorily recycled to the number of recycling steps that might be expected by applying the process of Document (2).
- 2.4.4 However, the Appellant has indicated no reason as to why the alleged advantage over the prior art disclosed in Document (2) should be relevant for assessing the inventive step in regard to the LAES process disclosed in Document (1).

The Board concludes that the Appellant did not bring any evidence that this additional effect has been achieved also with regard to the process of Document (1). Therefore, this effect has to be disregarded in the assessment of inventive step.

2.4.5 The Board also observes that the description of the experimental report labelled Document (9) is also **too obscure** to represent credible evidence. If, as alleged by the Appellant, the ambiguities in this experimental report (see above point VII of Facts and Submissions) derived simply from an erroneous translation of the original Japanese text (in particular, in that the expression "*degummed oil*" was erroneously considered by the translator a synonym of "*crude oil*"), then the Appellant should have provided a correct translation of the experimental report, unambiguously describing the actually carried experiments.

## 2.5 Evaluation

2.5.1 The question relevant for the inventive step assessment boils down to establishing whether or not the person skilled in the art would have considered obvious to reduce the particle size of the oil or fat droplets dispersed in the aqueous phase in the LAES process of Document (1) in order to solve the existing technical problem of providing a more efficient enzymatic removal of the phospholipids from oils and fats (see above point 2.4.1).

2.5.2 The Board notes that it belonged to the common general knowledge of the person skilled in the art that the refining reaction between the enzyme dissolved in the aqueous phase and the phospholipids dissolved in the oily phase can only occur at the interface between the two phases.

This has been explicitly confirmed by the parties.

2.5.3 Therefore, the Board finds that the person skilled in the art, confronted with the technical problem of promoting the efficiency of the refining process based on this reaction, would have searched for further information (as to the reaction and the measures for promoting it) in the technical field of oil and fat refining processes that are evidently based on this kind of reaction.

Since the same interface is to be expected in oil-in-water as well as in water-in-oil emulsions, the skilled person searching for a solution to the posed problem would have consulted any oil and fat refining process of the prior art based on the use of aqueous enzyme solutions, independently as to whether it comprised water-in-oil or oil-in-water emulsions.

2.5.4 Therefore, the skilled person would have considered Document (2), which confirms explicitly (see from page 2, line 56 to page 3, line 1) the fact that also in the water-in-oil process of this prior art the refining reaction must take place at the interface between the two phases.

This portion of Document (2) also teaches that the enzymatic reaction at the interface is favoured by the application of turbulent agitation and even further by the addition of tenside. This citation further specifies (see Document (2) page 3, lines 18 to 25) that turbulent mixing results in oil particles having size of less than 10  $\mu\text{m}$  and describes in example 1 an oil particle size of 0.1  $\mu\text{m}$ .

Therefore, this citation provides the technical information that the use of a turbulent mixing to produce oil particles of less than 10  $\mu\text{m}$  of diameter, preferably 0.1  $\mu\text{m}$ , promotes the refining reaction taking place at the interface between the phospholipid containing oily phase and the enzyme containing aqueous phase.

- 2.5.5 The Appellant has provided no reasoning or evidence as to why the differences between the two kinds of emulsion (water-in-oil vs. oil-in-water) used in Documents (1) and (2) could result in substantial differences in the refining reaction taking place at the interface in both cases. Accordingly, the Appellant's argument that the different kinds of emulsions would have discouraged the skilled person from combining the teachings of these two citations, amounts to an unjustified allegation and is, therefore, irrelevant in respect of the reasons given above at point 2.5.3.
- 2.5.6 The further Appellant's allegations as to the fact that the person skilled in the art would find in Document (2) only the instruction to produce the finest possible particles (see Document (2) page 2, lines 56 to 57) or

to add a surfactant in combination with the turbulent mixing (see Document (2) the paragraph bridging pages 2 and 3) are also found not convincing since:

(a) as indicated above (see point 2.5.4) the suggestion in Document (2) to achieve the finest possible particle dispersion is to be interpreted in combination with the subsequent passage at page 3 which specifies that, in general, particles of less than 10  $\mu\text{m}$  diameter are acceptable for the process described in this citation and with example 1 that specifically discloses oil particles of 0.1  $\mu\text{m}$ , i.e. the lower limit for the particle size range defined in present claim 1,

and

(b) the instruction actually given in the paragraph bridging pages 2 and 3 of Document (2) is that the enzymatic reaction is promoted by the turbulent mixing and, in addition ( see at the last line of page 2, "...zusätzlich") by the presence of tensides, i.e. that already the turbulent mixing *per se* is capable of promoting the enzymatic reaction.

2.5.7 Finally, the Appellant argued that (at the filing date of the patent in suit) the skilled person would have regarded the use of turbulent mixing potentially detrimental to the enzyme activity. The Board observes that this allegation is based on Document (11), that is a short abstract of a scientific paper published years after the filing date of the patent in suit and that refers exclusively to a single study on one specific enzyme. Such evidence is therefore insufficient to demonstrate the existence of a generally accepted

prejudice as to the fact that turbulent mixing may cause loss of activity of enzymes in general and that such prejudice existed at the filing date of the patent in suit.

2.5.8 Hence, the Board concludes that it was obvious for the person skilled in the art to use in the LAES process of Document (1) a turbulent mixing as taught in Document (2), which result in dispersed oil or fat particles with a size below 10  $\mu\text{m}$  of diameter, preferably 0.1  $\mu\text{m}$ , in order to promote the enzymatic decomposition of the phospholipids.

2.6 For these reasons, the Board finds that the subject-matter of claim 1 of the only request of the Appellant does not comply with the requirements of Articles 52(1) and 56 EPC.

## Order

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

The appeal is dismissed.

The Registrar:



G. Rauh

The Chairman:



L. Li Voti