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**Datasheet for the decision
of 1 December 2010**

Case Number: T 0356/04 - 3.3.05

Application Number: 90203444.6

Publication Number: 0437888

IPC: B01D 1/16

Language of the proceedings: EN

Title of invention:

Computer-controlled spray-drying process

Patentee:

Unilever N.V., et al

Opponents:

Henkel AG & Co. KGaA
PROCTER & GAMBLE EUROPEAN TECHNICAL CENTER

Headword:

Spray-drying control/UNILEVER

Relevant legal provisions:

EPC Art. 56

Relevant legal provisions (EPC 1973):

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Keyword:

"Inventive step: no (all requests) - no evidence of an improvement - reformulation of the problem - provision of a further process - obvious solution"

Decisions cited:

T 1198/97

Catchword:

-



Case Number: T 0356/04 - 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 1 December 2010

Appellant 1: Henkel AG & Co. KGaA
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Appellant 2: PROCTER & GAMBLE EUROPEAN TECHNICAL CENTER
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 9 February 2004
rejecting the opposition filed against European
patent No. 0437888 pursuant to Article 102(2)
EPC 1973.

Composition of the Board:

Chairman: G. Rath
Members: B. Czech
C. Vallet
A. Madenach
S. Hoffmann

Summary of Facts and Submissions

I. The appeal is from the decision of the opposition division posted on 9 February 2004 to reject the oppositions against European patent No. 0 437 888.

II. Claim 1 of the patent as granted reads as follows:

"1. A spray-drying process which comprises feeding an aqueous slurry to a spray drying zone, contacting the slurry with drying air to form a spray dried powder, in which the moisture content of the powder is automatically maintained at a pre-set level by measuring its actual value and feeding it to a computer which at least controls the temperature and/or flow of drying air as a function of past values of said flow and/or temperature and as a function of current and past values of the powder moisture content."

III. In the earlier decision T 1198/97 of 5 March 2001 concerning the patent in suit, Board 3.3.05 (in a different composition) held inter alia that the subject-matter of claim 1 of the patent as granted was novel over the disclosure of document

D1: Fette, Seifen, Anstrichmittel, 87, No. 10, 1985, pages 417 to 420

since the latter did not disclose "the use of past values of actual process parameters for controlling the temperature and/or flow rate of drying air" (Reasons, point 3). The board moreover considered it appropriate to remit the case to the opposition division for the

examination of the issue of inventive step (Reasons, point 5).

IV. In the decision under appeal, the opposition division concluded that the subject-matter of the claims of the patent as granted was inventive in view of the prior art including D1, even when taking into account common general knowledge as illustrated by document

E2: "Process Dynamics and Control"; Seborg D.E. et al; 1989, John Wiley & Sons; Chapters 18 and 27.

More specifically, the opposition division held (contested decision, point XI of the reasons, last sentence) that "common general knowledge alone is not sufficient to motivate the skilled man, starting from D1, to arrive at the subject-matter of claim 1".

V. In its statement of grounds of appeal, appellant 1 (opponent 1) argued that the subject-matter of claim 1 of the patent in suit was not patentable, inter alia on the ground of lack of inventive step in view of the combination of D1 with E2.

VI. In its statement of grounds of appeal, appellant 2 (opponent 2) also maintained its earlier objection that the subject-matter of claim 1 of the patent in suit was not inventive, inter alia in view of a combination of the disclosure of D1 with common general knowledge as illustrated by document E2.

VII. In a further letter, appellant 2 inquired whether a transfer of the appeal case to a board with expertise

in handling computer control processes would be possible and more convenient.

VIII. In its letter of 20 October 2004, the respondent (proprietor of the patent) requested an extension of the time limit for responding since it needed some time to seek and find a person skilled in the art of control engineering to assist in preparing the response.

IX. In its reply dated 22 December 2004, the respondent argued that the claimed process was not obvious.

Moreover, it requested that the appeal case be dealt with by the board already in charge, which in its view was the appropriate one since claim 1 of the patent was directed to a spray-drying process.

The respondent asked for "a written decision on the basis of the submissions to date".

Under cover of the same letter, the respondent also filed three amended sets of claims as first to third auxiliary requests.

Claim 1 according to the first auxiliary request differs from claim 1 as granted in that the following additional features have been appended:

", in which process the flow of drying air and/or the temperature thereof is also regulated as a function of current and past values of the slurry flow rate".

Claim 1 according to the second auxiliary request differs from claim 1 according to the first auxiliary

request in that the following additional features have been appended:

", and the computer calculates the flow of drying air and/or the temperature thereof from linear combinations of said current and past values".

Claim 1 according to the third auxiliary request reads as follows (amendments to claim 1 as granted highlighted by the board):

*"1. A spray-drying process **for the production of a detergent powder or a component thereof** which comprises feeding an aqueous slurry **comprising a detergent active compound** to a spray drying zone, contacting the slurry with drying air to form a spray dried powder, in which the moisture content of the powder is automatically maintained at a pre-set level by measuring its actual value and feeding it to a computer which at least controls the temperature and/or flow of drying air as a function of past values of said flow and/or temperature and as a function of current and past values of the powder moisture content, **in which process the flow of drying air and/or the temperature thereof is also regulated as a function of current and past values of the slurry flow rate, and the computer calculates the flow of drying air and/or the temperature thereof from linear combinations of said current and past values.***

- X. In a further reply, appellant 1 also objected to the respondent's auxiliary requests on the ground of lack of inventive step. Appellant 1 also considered that a change of the board in charge of the case would be appropriate.

- XI. On 9 December 2005, in application of Article 9 of the RPBA, the board was enlarged by a further technical member from board 3.5.03 (entrusted inter alia with cases classified in G05) and a further legal member.
- XII. The parties were summoned to oral proceedings. In a communication dated 27 July 2010 issued in preparation for oral proceedings and expressing its non-binding and non-exhaustive opinion, the board addressed inter alia the following points:
- The respondent had not yet taken a stance on the objections raised by appellant 1 having regard to the former's first to third auxiliary requests.
 - The amendments in the claims according to the respondent's auxiliary request had not been objected to by the appellants and appeared to be allowable under Article 123(2)(3) EPC.
 - D1 appeared to be a reasonable starting point for assessing inventive step.
 - The appellants argued that the claimed subject-matter lacked inventive step inter alia in view of a combination of D1 and common general knowledge as illustrated e.g. by E2.

Furthermore, the board raised the question whether or not, taking into account common general knowledge and/or the teaching of the patent literature cited, relying on a control algorithm wherein (at least) temperature and/or flow of the drying air (manipulated variables) is controlled as a function of (at least) past and present values of drying air temperature and/or flow and of powder moisture (input variables) could be considered to achieve some unexpected

advantage in the technical context concerned, e.g. as compared to the control process of D1.

The board also commented on the possible impact on the question of obviousness of the amendments made to the claims according to the auxiliary requests.

- XIII. With their letters dated 9 August 2010 and 21 July 2010, respectively, appellants 1 and 2 informed the board that they would not be attending the oral proceedings.
- XIV. On 23 November 2010, the respondent informed the board that it would not attend the oral proceedings and confirmed its request for "a written decision on the basis of the submissions to date".
- XV. The arguments of the parties, as far as they have a bearing on the present decision, can be summarised as follows:

Having regard to claim 1 as granted, **appellant 1** submitted that D1 did not explicitly disclose that past values of input and output variables were used in the regulation of the input variables. However, designing a predictive control model based on regression analyses and taking into account past measured values belonged to the common general knowledge illustrated e.g. by chapter 27 of E2. The subject-matter of claim 1 was thus obvious in view of D1 in combination with E2. Since D1 also mentioned slurry flow as an input variable to be regulated, these considerations also applied to claim 1 according to the first auxiliary request. Using a model relying on linear combinations of current and past values as required by claim 1 of

the second auxiliary request, e.g. based on regression analyses, was also obvious in view of D1. Since D1 concerned the spray-drying of detergents, the additional features of claim 1 according to the third auxiliary request could not render the claimed process inventive.

Having regard to the process according to claim 1 as granted, **appellant 2** considered inter alia that the skilled person would be familiar with common general knowledge of computer control systems for treatment processes having a time lag between modifying the input conditions and observing the effect of this modification in the output properties, as illustrated by E2 (chapter 27). In such circumstances, the skilled person wanting to implement a system as described in D1 taken as closest prior art would obviously make use of past values of powder moisture and drying air flow, i.e. by means of well-known predictive control techniques on the basis of software and hardware available at the priority date, e.g. a Dynamic Matrix Controller (DMC), in order to achieve the desired reliable control.

The **respondent** submitted that "at the priority date of the opposed patent, it was not at all obvious to apply the claimed control process to a spray drying operation in a process for manufacturing a powder. The art and arguments submitted by the appellants had been derived from the specialist discipline of control engineering. At the priority date, such knowledge had not hitherto been applied to spray drying operations and there was no reason for the person skilled in the art of spray drying to acquire or apply such expertise."

It did not present any arguments specifically concerning the amended claims according to the three auxiliary requests.

- XVI. Both appellant 1 and appellant 2 requested in writing that the decision under appeal be set aside and the patent be revoked.

The respondent requested in writing that the appeals be dismissed or, in the alternative, that the patent be maintained on the basis of the claims of one of the first to third auxiliary requests filed with letter of 22 December 2004.

- XVII. Oral proceedings were held on 1 December 2010 in the absence of the parties. After deliberation, the board announced its decision.

Reasons for the Decision

1. The amended claims according to the respondent's first to third auxiliary requests are not objectionable under Article 123(2)(3) EPC, since the amendments merely consist in the incorporation of the features of one or more dependent claims into independent claims 1 as granted. This was not disputed by the appellants.
2. Therefore, as indicated in the communication issued in preparation for the oral proceedings (see point III above), the only issue that remains to be decided in the present case is that of inventive step.

Inventive step - 3rd auxiliary request

3. Claim 1 according to the respondent's third auxiliary request, by virtue of the further limiting features incorporated into claim 1 as granted, defines the process in its narrowest terms.

4. The patent in suit (page 2, lines 1 to 8) relates to computer-controlled spray-drying processes, more particularly to a process for the production of detergent powders by spray-drying which is automatically controlled in order to maintain the moisture of the powder obtained at a preset-value.

5. The board, in agreement with all the parties (see contested decision, point XI of the reasons), considers document D1 to represent the most suitable starting point for the assessment of inventive step.
 - 5.1 D1, like the patent in suit, relates to a computer-controlled process for the preparation of detergent powders by feeding an aqueous slurry to a spray-drying zone, contacting the slurry with drying air to form a spray dried detergent powder (see e.g. the title of the English Abstract and Figure 1).
 - 5.1.1 According to D1, the moisture ("Wassergehalt") of the spray-dried detergent powder is one of the output variables ("Zielgrößen") to be automatically maintained at a pre-set, optimum constant level (page 418, right-hand column, lines 10 to 13 and the table in Figure 2; page 419, right-hand column, lines (text) 30 to 34) by the process control computer.

- 5.1.2 D1 refers to about 50 variables that are continuously measured and specifically mentions the amount (i.e. the flow rate) of slurry (expressed as "Pastenmenge"), as well as the temperature and flow rate of the drying air (expressed as "Trockenluftmenge" and "Trockenlufttemperatur"), as basic input variables of the control system (see page 418, eighth line from the bottom in the left-hand column to line 4 of the right-hand column; the table of Figure 2 refers to "Eingangsgrößen" and "Regelgrößen").
- 5.1.3 The process of D1 is expressly designed such as to permit a rapid compensation of deviations by the control system (p.418, left-hand column, line 22).
- 5.1.4 According to D1 (page 418, right-hand column, the last three paragraphs), this rapid compensation is achieved by continuously measuring all the input and output variables and by establishing a control model mathematically linking the input and output variables, based on a thorough analysis of the process, experimental runs and regression analyses.
- 5.1.5 Moreover, the authors of D1 expressly mention the time lags occurring in a process for spray drying detergents (page 419, left-hand column, top paragraph), which have to be taken into account in the mathematical modelling.
- 5.2 However, D1 does not even implicitly disclose directly and unambiguously a control model making use of past values of actual process parameters (see T 1198/87, point 3 of the reasons), let alone a model involving the calculation of the flow and/or temperature of the

drying air from linear combinations of current and past values.

6. According to the patent in suit (page 2, lines 25 to 26, 30 to 33 and 52 to 53), the technical problem underlying the patent in suit consists in providing a spray-drying method which is improved as compared to manual control and which overcomes drawbacks associated with some known automatically controlled spray drying processes.
- 6.1 However, the only improvement actually shown in the patent in suit is that the specific automatic control as described in example 3, which takes into account past moisture, slurry rate and fan speed (drying air flow) values, leads to better moisture level maintenance (less variation) compared to manual control performed by an experienced operator manipulating a single variable.
- 6.2 Compared to a process with an automated control based on a mathematical modelling of the interdependences of the process variables as disclosed in D1, no improvement has been shown or alleged by the respondent.
- 6.3 In fact, in the board's view, when putting into practice the teaching of D1, the skilled person would inevitably overcome drawbacks associated with the manual variation of one process parameter, e.g. the flow of hot (drying) air (page 2, lines 22 to 24), and with an automated control system having a feedback-loop without sufficient delay compensation (see patent, page 2, lines 34 to 40).

- 6.4 Therefore, in the light of D1 as the closest prior art, the technical problem must be reformulated in a less ambitious manner and consists in providing a further automatically controlled process for spray-drying detergent.
7. As a solution to said technical problem the patent now proposes a spray-drying process for the production of a detergent powder or a component thereof according to claim 1 of the third auxiliary request which is in particular characterised in that
- i) the moisture content of the powder obtained is automatically maintained at a pre-set level by measuring its actual value and feeding it to a computer which at least controls the temperature and/or flow of drying air as a function of past values of said flow and/or temperature, as a function of current and past values of the powder moisture content, and as a function of current and past values of the slurry flow rate, and in that
 - ii) the computer calculates the flow of drying air and/or the temperature thereof from linear combinations of said current and past values.
8. Considering the results presented in example 3 and Figures 5 to 9 of the patent in suit and the absence of arguments to the contrary by the appellants, the board concludes that the stated technical problem is indeed solved by the claimed process. In particular, it is plausible that the claimed process permits maintaining the moisture of the powder obtained at a pre-set level and rapidly bringing the moisture to said pre-set level after start-up (patent page 2, lines 30-33 and page 3,

- lines 10-11) or upon load changes (see e.g. examples 2 and 3).
9. Hence, it remains to be assessed whether the proposed solution to the stated technical problem is obvious in view of the cited prior art.
- 9.1 Despite the involvement of a control expert (see point VIII above) in preparing its response to the appeals, the respondent merely argued that it was not obvious to apply the claimed control process to a spray-drying operation in a process for manufacturing a powder, because there was no reason for the skilled person in the art of spray-drying to acquire or apply expertise in the specialist discipline of control engineering.
- 9.2 The board cannot adhere to this view, since in the present case the skilled person working in the field of D1 (industrial spray-drying of detergents) is a process engineer and therefore disposes of considerable knowledge in process control.
- 9.3 For the skilled person, the disclosure of D1 points, for the following reasons, towards the implementation of a predictive control technique, which as such belongs to common general knowledge (see e.g. the textbook E2 and point 9.6 below).
- 9.4 D1 itself, by virtue of the references to a process study ("Prozeßbeobachtung"), experimental pre-runs ("Versuchspläne") and regression analyses leading to a mathematical control model (page 418, right-hand column, last paragraph), will be understood by the skilled

person as a reference to control methods based on a process model typical of predictive control techniques.

9.5 Moreover, considering that the control system described in D1 is of a MIMO type (multiple input multiple output) and that D1 stresses the fact that considerable time lags occur in the spray drying process described (see point 5.1.5 above), the board accepts the argument of appellant 2 (points 51 and 57 of its statement of grounds of appeal) that the skilled person aiming at providing a process optimised in terms of moisture content control, would consider implementing a predictive control of a type already successfully used under such circumstances in commercial process control application, e.g. Dynamic Matrix Control (see E2, page 649, lines 5 to 18).

9.6 In particular, the matrix form for predictive models discussed in chapter 27.3 of E2 provides a control system which takes into account current and past values of the predicted variable and the past values of any number of manipulated variables. As this control method allows for an arbitrary number of predictions (chapter 27.3, first sentence), the skilled person would at least be tempted to implement the control process described in D1 by applying the particular approach according to E2.

9.7 When such a control system is implemented in the context of the disclosure of D1, the predicted variable would be the powder moisture. Since in a continuous drying operation, the input of water (e.g. expressed as slurry flow rate) and of the input heat (e.g. expressed as drying air flow and/or temperature) belong to the

most relevant variables (see also the table on page 418 of D1), an optimised process control will necessarily take into account (at least) these variables as manipulated variables. Varying the input of the heat, i.e. the drying air temperature and/or flow in response to moisture variations by means of a feed-backward control in order to compensate for variations in the moisture of the spray-dried end product appears to be the straightforward measure which does not affect the slurry feed rate and the end-product (detergent) output rate. In processes wherein varying slurry flow rates (water input) occur (e.g. startup, load change as referred to in the examples), the skilled person will also immediately envisage a feed-forward control acting on the heat input in order to avoid fluctuations in the moisture content.

9.8 Considering the time lags associated with changes in the slurry feed rate, in the drying air temperature and flow, and in the moisture content, the skilled person would, as already mentioned, adopt a predictive model, e.g. a MIMO controller of the DMC type, and in doing so would thus in particular take into account past values of slurry feed rate, moisture content and drying air flow and/or temperature as required by claim 1.

9.9 Furthermore, when such a control system is implemented in the context of the disclosure of D1, the use of calculated linear combinations of present and past values constitutes the simplest and therefore most obvious approach. This is also acknowledged in the patent in suit (page 3, line 18). Feature ii) of the claimed solution (see point 7 herein above) can thus

not contribute to rendering the claimed process inventive.

9.10 The board therefore concludes that the skilled person starting from D1 as the closest prior art and aiming at putting the teaching of D1 into practice would arrive at the subject-matter of claim 1 based on routine design considerations merely involving common general knowledge in the field of control engineering as illustrated by E2.

10. Hence, the subject-matter of claim 1 according to the third auxiliary request does not involve an inventive step as required by Article 52(1) in conjunction with Article 56 EPC.

Inventive step - Main request, 1st and 2nd auxiliary requests

11. The board's conclusion concerning the obviousness of the subject-matter of claim 1 according to the third auxiliary request also applies to the respective claims 1 of the main request and of the first and second auxiliary requests, which are broader in scope and cover the process according to claim 1 of the third auxiliary request. Consequently, the subject-matter of claim 1 as granted, of claim 1 according to the first auxiliary request and of claim 1 according to the second auxiliary request also lacks an inventive step (Articles 52(1) and 56 EPC)

12. It follows that none of the respondent's requests is allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar

The Chairman

C. Vodz

G. Raths