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**Datasheet for the decision
of 15 March 2012**

Case Number: T 1531/09 - 3.3.10

Application Number: 99943081.2

Publication Number: 1109772

IPC: C07C 51/215, C07C 51/25,
C07C 53/08, C07C 67/05,
C07C 69/15

Language of the proceedings: EN

Title of invention:
Process for the production of acetic acid

Patentee:
BP Chemicals Limited

Opponent:
Celanese International Corporation

Headword:
Process for the production of acetic acid/BP

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Main request: novelty (no)"
"Auxiliary request: novelty (yes) - inventive step (no)"

Decisions cited:
-

Catchword:
-



Case Number: T 1531/09 - 3.3.10

DECISION
of the Technical Board of Appeal 3.3.10
of 15 March 2012

Appellant: BP Chemicals Limited
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 18 May 2009
revoking European patent No. 1109772 pursuant
to Article 101(3)(b) EPC.

Composition of the Board:

Chairman: P. Gryczka
Members: J.-C. Schmid
D. S. Rogers

Summary of Facts and Submissions

I. The Appellant (Proprietor of the patent) lodged an appeal against the decision of the Opposition Division revoking European patent No. 1 109 772, whose independent claims 1 and 12 as granted read as follows:

"1. A process for the production of acetic acid which process comprises contacting ethane and/or ethylene with a molecular oxygen-containing gas in a fluid bed reactor in the presence of a microspheroidal fluidised particulate solid oxidation catalyst, wherein at least 90% of said catalyst particles are less than 300 microns."

"12. An integrated process for the production of acetic acid and/or vinyl acetate which comprises:

(a) contacting in a first reaction zone a feedstock comprising ethylene and/or ethane and optionally steam with a molecular oxygen-containing gas in the presence of a microspheroidal fluidised particulate solid oxidation catalyst wherein at least 90% of said catalyst particles are less than 300 microns for the oxidation of ethylene to acetic acid and/or ethane to acetic acid to produce a first product stream comprising acetic acid, water and ethylene (either as unreacted ethylene and/or as co-produced ethylene) and optionally also ethane, carbon monoxide, carbon dioxide and/or nitrogen; and

(b) contacting in a second reaction zone in the presence or absence of additional ethylene and/or acetic acid at least a portion of the first gaseous

product stream comprising at least acetic acid and ethylene and optionally also one or more of water, ethane, carbon monoxide, carbon dioxide and/or nitrogen with a molecular oxygen-containing gas in the presence of a catalyst active for the production of vinyl acetate to produce a second product stream comprising vinyl acetate, water, acetic acid and optionally ethylene."

II. An opposition was filed by the Respondent (Opponent) requesting revocation of the patent in suit in its entirety upon the basis of lack of inventive step. *Inter alia* following documents were cited in the opposition proceedings:

- (1) WO-A-98/05620 and
- (2) DE-A-196 30 832.

III. According to the Opposition Division, document (2) disclosed a process for the production of acetic acid comprising contacting ethane and/or ethylene with a molecular oxygen-containing gas in a fluid bed reactor in the presence of a catalyst with a particle size from 10 to 200 μm produced by milling or spray-drying. As it was acknowledged by all Parties that particles obtained by spray-drying were microspheroidal, the Opposition Division came to the conclusion that claim 1 as granted lacked novelty over document (2).

IV. With a letter dated 15 February 2012, the Appellant filed a new auxiliary request, thus superseding its former auxiliary request. Claim 1 of the auxiliary request was identical to claim 12 of the main request

(granted claims). In support of its arguments it filed document:

(10) English translation of document (2).

The Appellant considered the Respondent's late filing of document (11) as an abuse of the procedure (see point V below). This document, independently of its relevance, should not be admitted into the proceedings. From document (10), which was the English translation of document (2), it was clear that the catalyst may either be ground to a particle size in the range of 10 to 200 μm or be manufactured by spray-drying. Hence, document (2) did not disclose a catalyst which was spray-dried, and therefore microspheroidal in shape in combination with the feature that at least 90% of the catalyst particles were less than 300 μm . Hence, claim 1 of the main request was novel over document (2).

Document (2) related only to acetic acid production and made no disclosure of the production of vinyl acetate from acetic acid and ethylene. The subject-matter of claim 1 of the auxiliary request thus was novel over document (2) by virtue of step (b) of the claimed process wherein at least a portion of the first product stream comprising at least acetic acid and ethylene was contacted with a molecular oxygen-containing gas to produce a second product stream comprising vinyl acetate, water, acetic acid and optionally ethylene.

As regards inventive step of the subject-matter of claim 1 of auxiliary request 1, document (1) was the closest state of the art to the invention. This document related to a two-step integrated process for

the production of acetic acid and/or vinyl acetate comprising a first step in which ethane/ethylene were oxidised in the presence of a catalyst to produce a first product stream comprising acetic acid, water and ethylene, followed by a second step in which at least a portion of the first product stream comprising at least acetic acid and ethylene was contacted with a molecular oxygen-containing gas in the presence of a catalyst to produce a second product stream comprising vinyl acetate, water, acetic acid and optionally ethylene. The claimed process differed from this prior art in that it required that the catalyst particles in step (a) should be microspheroidal and that at least 90% of said catalyst particles were less than 300 μm . The effect of this difference was that the catalyst of step (a) had improved attrition resistance. Thus, the objective technical problem to be solved with respect to document (1) was to provide an attrition resistant catalyst for use in the fluidised bed production of acetic acid by the oxidation of ethane and/or ethylene in the first step of a two-step integrated process for the production of acetic acid and/or vinyl acetate. The solution was the use of a catalyst in step (a) which was spheroidal and wherein at least 90% of the particles had a size of less than 300 μm . Document (2) related to both fixed bed and fluidised bed production of acetic acid by the oxidation of ethane/ethylene and since it was completely silent on the issue of attrition resistance, it could not suggest that a catalyst which was spheroidal in shape and less than 300 μm in size would have improved attrition resistance.

The Respondent's contention that it was common general knowledge that catalyst particles must have a particle

size of less than 300 μm in order to achieve fluidisation was not supported by any evidence. Furthermore, fluid behaviour and attrition were independent characteristics of particles, with the consequence that the fluid behaviour was irrelevant to the attrition problem under consideration. Thus, the skilled person would not turn to document (2) to solve the problem of providing an attrition resistant catalyst. Therefore the subject-matter of claim 1 of the auxiliary request involved an inventive step.

- V. According to the Respondent, the Opposition Division made the correct interpretation of page 3, lines 52 to 54 of document (2), namely that a particle size of from 10 to 100 μm was obtained by either milling or spray drying. Hence, document (2) was clearly novelty-destroying for claim 1 of the main request.

With respect to the auxiliary request, the second step of the process of claim 1 represented a further reaction that would inevitably be occurring when the first step was carried out. Although the second step of claim 1 required a catalyst active for the production of vinyl acetate, it could be the same catalyst as for the selective production of acetic acid. Moreover, the use of the microspheroidal catalyst in the process of document (2) inevitably resulted in the production of some vinyl acetate as a by-product with the consequence that the presence of a catalyst active for the production of vinyl acetate as recited in claim 1 was met in document (2). Although claim 1 of the auxiliary request was directed to a integrated process comprising a first and a second reaction zone, there was no explanation in the patent-in-suit on what limitations

these terms imply. A situation where the first and the second reaction zones were the same was thus encompassed by claim 1. Hence, document (2) was also novelty destroying for claim 1 of the auxiliary request.

Document (11): Study in Surface Science and Catalyst, volume 79, Catalysis, page 323,

was filed in response to the Appellant's arguments and was relevant to inventive step, in particular to demonstrate what was common general knowledge. Since the late filing of this document was therefore not an abuse of the proceedings, it should be admitted in the appeal proceedings.

Document (1) represented the closest prior art to the subject-matter of claim 1 of the auxiliary request. The process according to claim 1 differed therefrom by the fact that in the first step the catalyst particles were microspheroidal and that at least 90% of the particles were less than 300 μm . The first consideration when choosing the appropriate size and shape of the catalyst to be used in a fluidized bed was that it had to show a fluid behaviour. It was common general knowledge that the preferred particles for use in a fluidized bed were spherical and less than 300 μm in size, document (2) for instance teaching particle size between 10 and 200 μm . Furthermore, document (11) taught that spray-drying produced attrition-resistant spherical particles with a diameter between 10 and 100 μm which were used in a fluidised bed. Accordingly, the skilled person wishing to carry out the first step of the process disclosed in document (1) with an attrition resistant catalyst would have considered the catalyst particles

of document (2) disclosed for use in a fluidised bed, i.e. those produced by spray-drying and having a size between 10 and 100 μm . The subject-matter of claim 1 of the auxiliary request hence lacked an inventive step.

- VI. The Appellant requested in writing that the decision under appeal be set aside and that in the event that the Board considered that claim 1 as granted met the requirement of novelty that the case be remitted back to the Opposition Division for consideration of inventive step and, subsidiarily, that the patent be maintained according to the auxiliary request filed with the letter of 15 February 2012.

The Respondent requested that the appeal be dismissed.

- VII. The oral proceedings were held on 15 March 2012 in the absence of the Appellant, which after having been duly summoned, informed the Board that it would not attend. At the end of the oral proceedings the decision of the Board was announced.

Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility into the proceedings of document (11)*

Document (11) was cited for the first time in the Respondent's letter dated 2 March 2012. It reflects common general knowledge and was filed in response to the Appellant's challenge that it was not general knowledge that catalyst particles must have a particle

size of less than 300 μm in order to achieve good fluidisation and that fluid behaviour was irrelevant to the attrition problem.

The Appellant objected to its introduction into the appeal proceedings for the sole reason that it was filed at a very late stage of the proceedings.

As respects admissibility of late-filed documents, the crucial criteria to be taken into account are whether or not the new document is *prima facie* pertinent and whether or not there is proper justification for its late filing.

Document (11) is taken from a standard text book and illustrates the general knowledge of the skilled person. It is relevant for the assessment of inventive step, since it provides evidence relevant to the Respondent's argument based on common knowledge in the technical field, this general knowledge being challenged by the Appellant. Furthermore, the content of this document does not change the Respondent's line of argumentation against inventive step as set out in its reply to the statement of grounds of appeal (see page 5, paragraph 7ff.).

Accordingly, document (11) is admitted in these appeal proceedings.

Main request

3. *Novelty*

Document (2) discloses a process for the production of acetic acid which comprises contacting ethane and/or ethylene with gaseous oxygen in the presence of a catalyst (see claim 1). The catalyst for use in a fluidized bed has a particle size in the range from 10 to 200 μm and is prepared by milling or spray drying (see page 3 lines 52 and 54). As acknowledged by all Parties, spray drying is a technique which is known to produce spherical particles (also see document (11), page 323, paragraph 8.5.2, first sentence). Therefore, document (2) directly and unambiguously discloses the use of catalysts having a particle size of from 10 to 200 μm prepared by spray drying. Hence, document (2) discloses all the technical features required by the process of claim 1 and, thus, is novelty-destroying.

The Appellant argued on the basis of the English translation of document (2), i.e. document (10), that document (2) did not indicate any particle size for the catalyst particles obtained by spray-drying. However, the finding of lack of novelty is based on document (2) itself, and not on its translation provided by document (10). Since the translation of a document cannot invalidate its original disclosure, the Appellant's argument based on an interpretation of document (2) in the light of its translation must be rejected.

Auxiliary request

4. Claim 1 of the auxiliary request is identical to independent claim 12 of the patent-in-suit as granted which is based on claim 12 as originally filed. The requirements of Article 123(2) and (3) EPC are thus satisfied.

5. *Novelty*

The process according to claim 1 of this request differs from the process of claim 1 of the main request in that it comprises a second step requiring a second reaction zone to produce a second product stream comprising vinyl acetate, water and acetic acid. The Respondent challenged novelty of this request upon the basis of document (2) which relates to a process for selectively producing acetic acid.

Though conceding that the second step of the claimed process was not disclosed in document (2), the Respondent submitted that this feature represented a further reaction that would be occurring when the first step was carried out. The Board notes, however, that the production of vinyl acetate is nowhere disclosed in document (2), let alone in a second reaction zone.

Hence, since document (2) does not disclose a second reaction zone wherein vinyl acetate is produced, the Board concludes that the subject-matter of claim 1 of the auxiliary request is novel.

6. *Inventive step*

6.1 *Closest prior art*

In agreement with the Parties the Board holds that document (1) represents the closest state of the art to the invention. This document discloses a two-step integrated process for the production of acetic acid and/or vinyl acetate comprising a first step (a) in which ethane/ethylene are oxidised in the presence of a catalyst to produce a first product stream comprising acetic acid, water and ethylene, followed by a second step (b) in which at least a portion of the first product stream comprising at least acetic acid and ethylene is contacted with a molecular oxygen-containing gas in the presence of a catalyst to produce a second product stream comprising vinyl acetate, water, acetic acid and optionally ethylene (see claim 1). The catalyst active for the oxidation of ethylene and/or ethane may be used in the form of a fixed or fluidised bed (page 8, lines 1 and 2).

6.2 *Technical problem underlying the patent-in-suit*

The technical problem to be solved with respect to document (1) is the provision of attrition resistant catalyst particles in the form of a fluidised bed for use in step (a) of the two-step integrated process for the production of acetic acid and/or vinyl acetate.

6.3 *Solution*

The solution proposed by the patent-in-suit is to choose catalyst particles for operating step (a) in a

fluidised bed, which are characterized by being spheroidal and in that at least 90% of the particles have a size of less than 300 μm .

6.4 *Obviousness*

Document (2) discloses a process for the production of acetic acid which comprises contacting ethane and/or ethylene with gaseous oxygen in the presence of a catalyst with a diameter between 10 and 200 μm prepared by spray drying, i.e. step (a) of the claimed process (see point 3 above). Furthermore document (11) is a standard text book establishing that spray drying is a shaping technique used to produce attrition-resistant spherical particles with a diameter between 10 and 100 μm for use in fluidised beds.

Accordingly, the skilled person looking to solve the problem of providing an attrition resistant catalyst for use in step (a) of the process disclosed in the closest prior art document (1) and knowing, as illustrated in document (11), that spherical particles having a diameter between 10 and 100 μm are attrition-resistant, would carry out step (a) of the prior art process with such catalyst particles, i.e. as disclosed in document (2). Hence, he would arrive at the subject-matter of claim 1 of the auxiliary request without the exercise of inventive skill.

Consequently, the Board comes to the conclusion that the subject-matter of claim 1 lacks an inventive step over the combination of document (1) and document (2).

7. *Conditional request for remittal*

The Appellant requested that the case be remitted back to the Opposition Division for consideration of inventive step in the event the Board set aside the decision and considered that claim 1 of the main request met the requirement of novelty.

However, as the Board found that claim 1 of the main request lacks novelty, this conditional request for remittal of the case to the first instance does not apply.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar

The Chairman

U. Bultmann

P. Gryczka