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Datasheet for the decision of 5 December 2018

Case Number: T 2288/14 - 3.2.05

Application Number: 08718866.0

Publication Number: 2125344

IPC: B29C70/34

Language of the proceedings: EN

Title of invention:
Manufacture of a fibre-reinforced composite moulding

Patent Proprietor:
Gurit (UK) Ltd.

Opponent:
Hexcel Corporation

Relevant legal provisions:
EPC Art. 54, 56, 100(b), 100(c)

Keyword:
Amendments - added subject-matter (no)
Sufficiency of disclosure - (yes)
Novelty - (yes)
Inventive step - (yes)

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Case Number: T 2288/14 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 5 December 2018

Appellant: (Opponent)	Hexcel Corporation 11711 Dublin Blvd. Dublin, CA 94568 (US)
Representative:	Ronald Maarten Pols Hexcel Composites Limited Ickleton Road Duxford, Cambridge CB22 4QB (GB)
Respondent: (Patent Proprietor)	Gurit (UK) Ltd. St Cross Business Park Newport Isle of Wight PO30 5WU (GB)
Representative:	Peter David Jenkins Page White & Farrer Bedford House John Street London WC1N 2BF (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 15 October 2014 rejecting the opposition filed against European patent No. 2125344 pursuant to article 101(2) EPC.**

Composition of the Board:

Chairman	P. Lanz
Members:	S. Bridge
	J. Geschwind

Summary of Facts and Submissions

I. The appeal was lodged against the decision of the opposition division rejecting the opposition filed against the European patent No. 2 125 344.

II. An opposition was filed against the patent as a whole based on article 100(a) EPC (lack of novelty, article 54 EPC, and lack of inventive step, article 56 EPC), article 100(b) EPC (the invention is not disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art) and article 100(c) EPC (added subject-matter extends beyond the content of the application as filed).

III. Oral proceedings were held before the board of appeal on 5 December 2018 in the absence of the appellant, whose representative had previously informed the board by fax dated 29 November 2018 that they withdraw their request for oral proceedings and rely on their written submissions.

IV. The appellant (opponent) requested in writing that the decision under appeal be set aside and that the patent be revoked.

V. The respondent (patent proprietor) requested as main request that the appeal be dismissed or, in the alternative, that the patent be maintained in amended form according to the claims of one of auxiliary requests 1 to 4 filed with the response to the grounds of appeal.

VI. Claim 1 as granted (main request) reads as follows (the added feature labelling (1) to (12) is the one used by the parties):

(1) "A method of manufacturing a fibre-reinforced composite moulding, the method comprising the steps of:

(2) disposing at least one layer (24,26) of fibrous reinforcing material within a mould (10);

(3) disposing at least one pre-preg layer (101) adjacent to the fibrous reinforcing material,

(4) the pre-preg layer (101) comprising fibrous reinforcement (800) at least partially impregnated with uncured first resin material (801),

(5) to form a laminar assembly of the at least one layer (24,26) of fibrous reinforcing material and the at least one pre-preg layer (101) within the mould (10);

(6) applying a vacuum to the assembly;

(7) infusing a flowable uncured second resin material, under the vacuum by vacuum assisted resin transfer moulding, into the at least one layer (24,26) of fibrous reinforcing material; and

(8) curing the first and second resin materials at least partially simultaneously to form the fibre-reinforced composite moulding

(9) which comprises at least one first structural portion formed from the fibrous reinforcement (800) and the cured first resin material (801) bonded to at least one second structural portion formed from the at least one layer (24,26) of fibrous reinforcing material and the cured second resin material,

(10) wherein the second infused resin material has a curing temperature range that is lower than the curing temperature range of the first pre-preg resin material (801),

(11) the curing step is carried out at a temperature within the curing temperature range of the second infused resin material, and

(12) the curing of the second resin material is exothermic and generates heat to raise the temperature of the first resin material (801) to within the curing temperature range of the first resin material (801)".

VII. The following documents are referred to in the present decision:

D5: "*Hybrid Fabrication Route - Cost Efficient CFRP Primary Airframe Structures*", R.Kaps, L.Herbeck, A.Herrmann, Proceedings of 25th International Congress on the Aeronautical Sciences held 3 to 8 September 2006, Hamburg, Germany;

D7: "*PRIMETM 20LV Epoxy Infusion System Product Data Sheet*", SP, undated;

D8: "*HexFlow® 200 Liquid Resin Infusion Warm Curing Epoxy System Preliminary Data Sheet*", Hexcel Corporation Publication E - HexFlow200, Feb 05;

D9: "*HexPly® M9.1F/M9.6F 75-160°C curing epoxy matrix Product Data*", Hexcel Corporation Publication FTU 143b, March 2007;

D10: "*HexCoat® 02 Epoxy gel coat system Product Data Sheet*", Hexcel Corporation Publication GTC140b, January 2006;

D13: "*HexPly® 6376 175°C curing epoxy matrix Product Data*", Hexcel Corporation Publication FTA051b, March 2007;

D14: "*HexFlow® RTM6 180°C epoxy system for Resin Transfer Moulding monocomponent system Product Data*", Hexcel Corporation Publication ITA 065c, May 2005;

D16a:"*SP Systems Guide to Composites*", SP Systems Composite Engineering Materials, Cover, table of contents, pages GTC-1-1098-1 to GTC-1-1098-64, Important notice (2 pages), undated;

D18: "*Carbon Fibers and their Composites*", Peter Morgan, Taylor & Francis Group, ISBN 0-8247-0983-7, 2005, cover, cover page, table of contents, pages 894 to 903, 913 to 921 and 995 to 997;

D20: "*Development of a composite cargo door for an aircraft*", HGSJ Thuis, Composite Structures 47 (1999), pages 813 to 819;

D21: "*A Data Sheet from ICI FIBERITE 977-2 EPOXY RESIN*", 15 December 1991;

D22: US 2004/0051214 A1;

D25: Graph "*Fiberite 977-2 isothermal cure*", undated;

D26: DE 101 56 123 A1;

D27: Graph "*6376 resin - isothermal cure*", undated;

D28: "*Handbook of Thermoset Plastics*", Sidney H. Goodman, 1998, ISBN 0-8155-1421-2, cover, cover page, pages 9 to 11;

D30: Web page for ICAS 2006, indicating that congress proceedings were available on CD ROM, printed 2-Nov-18;

D31: Web page from the library of Nanyang Technological University, indicating that a paper with the same title and authors as D5 was available on the CD ROM of the congress proceedings, printed 2-Nov-18;

D32: E-mail from Mr Ian Grant of 8 November 2018 concerning the CD ROM of ICAS 2006.

VIII. The appellant argued essentially as follows in the written procedure:

Added subject-matter

In view of the embodiments of the invention set out in the description of the application as filed, the feature of granted claim 1 of the flowable uncured second resin material being infused under vacuum "*by vacuum assisted resin transfer moulding*" is provided only in combination with the following features:

- an ambient curing infusion resin system; and
- a common curing step, whereby "*common curing*" is understood to involve imparting an activity or energy to cause the curing of both the first and second resin materials.

Therefore, the added text "*by vacuum assisted resin transfer moulding*" in granted claim 1 constitutes added subject-matter.

Understanding the term "temperature curing range" used in the claims

The skilled person knows as part of his common general knowledge that a resin material has a resin component and a hardener. Once the hardener is added, the resin material begins to cure irrespective of the temperature at which the resin material is held, but the reaction rate is temperature dependent. Since the curing reaction is exothermic this speeds up the curing reaction. In consequence, it is not possible to define a curing temperature range for resin material.

Even though some manufacturers of resin materials provide data sheets showing curing temperature ranges,

by virtue of the above, these data sheets merely present arbitrary curing temperature ranges which do not indicate the actual physical lower and upper limits of a curing temperature range for a resin material.

In consequence, features (10) and (12) of claim 1 as granted are meaningless and cannot contribute to novelty and inventive step.

The curing temperature range of the second infused resin material is to be understood as 0°C to 250°C so that features (8) and (11) of claim 1 as granted are always fulfilled.

Sufficiency of disclosure

The "*curing temperature range of the first resin*" and "*curing temperature range of the second resin*" are ill-defined parameters. The skilled person is not able on the basis of the disclosure of the patent in suit as a whole and using his common general knowledge to identify (without undue burden) the technical measures (selection of suitable first and second resin materials) necessary to solve the specific problem underlying the patent at issue, namely to provide an alternative method of co-curing two thermosetting resin materials such that one resin material has a curing temperature range that is lower than the curing temperature range of the other resin material, and wherein the curing of one resin material is exothermic and generates heat to raise the temperature of the other resin material from outside to within the curing temperature range of said other resin material.

Resins manufacturers do not readily make data sheets with a view to particular applications of the resin material in a composite materials application.

Furthermore, the patent in suit and the claims fail to specify the required curing times and curing rates.

The invention is thus not disclosed in a manner sufficiently clear and complete for it to be carried out by a skilled person.

Novelty - paper D5

Paper D5 was publicly available in 2006 as the conference proceedings were made available on a CD ROM which was issued upon registration of attendance at the conference (see web pages D30 and D31 and e-mail D32).

Paper D5 references pre-preg resin 6376 (page 3, left hand column and on page 7, left hand column below figure 7) and RTM6 infusion resin (page 5, right hand column). Data sheets D13 and D14 concern these materials and thus may be considered in combination with the disclosure of paper D5 to assess the novelty of claim 1.

HexPly® 6376 has an essentially open curing temperature range presented in graph D27. RTM6 also has an essentially open curing temperature range as it is also a thermoset resin. Data sheet D14 supports a gel temperature range from 120°C to 240°C for gel times from >240 minutes to 5 minutes.

Even if the view is taken that features (10) and (12) are technical features of claim 1, then features (10) and (12) are in fact present implicitly in any fibre

reinforced composite moulding in which two different curable resin materials (a first resin material in the pre-preg and a second infusible resin material) are present by virtue of the properties of these resin materials.

Therefore, the subject-matter of claim 1 lacks novelty over paper D5 when considered in combination with D13, D27 and D14 (as direct references).

Novelty - paper D20

Paper D20 refers to both RTM-6 resin (data sheet D14) and to Fiberite 977-2 as the pre-preg resin (data sheet D21). The designation of 977-2 is carried over in the nomenclature of the pre-preg to indicate the resin material which is contained in the pre-preg. This is a commonly accepted industry standard nomenclature within the field of the composites industry. Graph D25 was prepared by the appellant by analysis of 977-2 which was available to the appellant and supports the conclusion that the curing temperature range of epoxy resins does not have an upper limit. Features (10) and (12) are not suitable to establish novelty of the subject-matter of claim 1 over paper D20 because the curing temperature ranges of the first infused resin material and the second pre-preg resin material are essentially open ranges.

Therefore, the subject-matter of claim 1 lacks novelty over paper D20 when considered in combination with D21, D25 and D14 (as direct references).

Novelty - document D22

Document D22 discloses feature (8) of claim 1, because the first and second resin materials are cured simultaneously by heating the tool base (paragraph [0030]).

Feature (10) of claim 1 is meaningless because both the curing temperature range of the second infused resin material and curing temperature range of the first pre-preg resin material are essentially open temperature ranges, so that it is impossible for one range to be lower than the other. Feature (10) and the second part of feature (12) may thus be disregarded.

Therefore, the subject-matter of claim 1 lacks novelty over document D22.

Novelty - document D26

Document D26 teaches the use of two different epoxy resins as the first pre-preg resin material and the second infused resin material (paragraphs [0008] and [0038]). Document D26 discloses the "*co-curing process*" of the first and second resin materials in paragraphs [0038] and [0039] by reference to figure 3.

Since it is not possible to measure in a reliable and/or reproducible manner lower and upper limits for the curing temperature range of epoxy resins, feature (10) of granted claim 1 must be disregarded in the examination for novelty and inventive step because the feature is *per se* not suitable to distinguish the claimed invention over the state of the art.

Document D26 exemplifies a typical 180°C pre-preg system in combination with a liquid-resin system (paragraph [0041]). The liquid-resin system or injection resin system is RTM-6 (paragraph [0036], data sheet D14). According to the last page of data sheet D14, RTM-6 is a 160°C resin system. Thus, D26 discloses feature (10) as the combination of a first 180°C pre-preg resin material with a second 160°C infused resin material.

According to paragraph [0039], chambers B and C (shown in figure 1) are heated in phase 103 (shown in figure 3) to temperatures which are sufficient for the curing of the two resin systems (typically 160°C to 180°C, ca. 1-2 h).

The curing of RTM-6 is exothermic. However, the second part of feature (12) must be disregarded in the examination for novelty and inventive step because this feature is *per se* not suitable to distinguish the invention over the prior art.

Further, in relation to this exemplified combination of resin materials, paragraph [0039] teaches co curing at 160°C to 180°C for 1 to 2 hours which suggests a temperature increase during the curing step of from 160°C to 180°C. At the initial temperature in the curing step of 160°C, the 160°C second infused resin material RTM-6 will cure, and because RTM-6 is an epoxy resin, the cure will be exothermic and generate heat. This heat will raise the temperature of the first resin material from 160°C towards 180°C, i.e., to within the curing temperature range of the 180°C first pre-preg resin material. Thus document D26 discloses feature (12).

Therefore, the subject-matter of claim 1 lacks novelty over document D26.

Inventive step - Paper D5 as closest prior art

There is no remaining difference between the disclosure of paper D5 and claim 1 as granted. Therefore, the objective technical problem is the provision of an alternative which does not involve any improvement.

Combining RTM-6 (data sheet D14) as second infused resin material with pre-preg resin 6376 (data sheet D13) as disclosed in paper D5, the second infusion resin material cures faster than the first pre-preg resin material, and the heat generated by the curing of the second resin material speeds up the curing of the first resin material.

Data sheet D14 for RTM-6 discloses a cure in mould at 160°C for 75 minutes (page 4). Data sheet D13 for HexPly® 6376 discloses curing at 175°C (and 7 bar pressure) for 2 hours (page 2). HexPly® 6376 requires the more severe curing conditions (higher curing temperature 175°C vs. 160°C - and longer curing time - 120 minutes vs. 75 minutes). HexPly® 6376 at 160°C will require a curing time which is longer than 2 hours. Thus, at a given temperature of 160°C, according to the teaching of paper D5, the second infused resin material RTM-6 cures faster than the first pre-preg resin material HexPly® 6376. Since RTM-6 is an epoxy resin, its cure is exothermic and generates heat, which will speed up the cure of the HexPly® 6376 by raising the temperature towards the 175°C specified in data sheet D13.

The subject-matter of granted claim 1 claimed method is obvious having regard to D5 alone, or having regard to the combined consideration of paper D5 with data sheets D13 (for HexPly® 6376) and D14 (for RTM-6).

Inventive step - Paper D20 as closest prior art

There is no remaining difference between the disclosure of paper D20 and claim 1 as granted. Therefore, the objective technical problem is the provision of an alternative which does not involve any improvement.

The opposition division found that paper D20 does not disclose "*a vacuum assisted resin transfer moulding process*" in the sense of claim 1 as granted.

Document D22 does disclose such a VARTM process. The subject-matter of claim 1 as granted does not involve an inventive step having regard to the combination of paper D20 with document D22.

Inventive step - Document D1 as closest prior art

VARTM is a variation of RTM and thus would be considered by the skilled person starting from document D1 when seeking an alternative in view of general knowledge (textbook D18, guide D16a).

The further additional step of heat management thereby required is part of the normal practice of the skilled person.

The subject-matter of claim 1 as granted does not involve an inventive step having regard to the combination of document D1 with either textbook D18 or guide D16a.

Inventive step - Combination of paper D5 and document D1

In view of common general knowledge a skilled reader would understand that document D1 describes a generic RTM while paper D5 describes a more specific VARTM. A skilled reader would understand that the same combinations of resins can be used in RTM and VARTM. From the point of view of the skilled person, there is no link between the selection of the resins on the one hand, and the choice between positive pressure and vacuum, between two-part mould and one-part mould/ vacuum bag and between heated/insulated moulds and furnace/autoclave on the other hand. Therefore, a skilled person would read across between document D1 and paper D5, and would understand that the resin combination of document D1 can be used equally and advantageously in the process of paper D5.

The subject-matter of claim 1 as granted does not involve an inventive step having regard to the combination of paper D5 with document D1.

Inventive step - Document D22 as closest prior art

The subject-matter of granted claim 1 does not differ from document D22. Therefore, the objective technical problem is the provision of an alternative which does not involve any improvement.

Document D22 is silent with regard to the chemical nature of the infused resin. The choice of an epoxy resin such as RTM-6 for the infusion resin does not involve an inventive step having regard to general references such as guide D16a or data sheet D14.

Handbook D28 states at page 9, first paragraph, lines 3-4, that "*all commercial thermosetting reactions are exothermic*" and hence refers in lines 3 and 4 of the third paragraph to "*the heat generated from the exothermic reaction*".

The subject-matter of claim 1 as granted does not involve an inventive step having regard to the combination of document D22 with a secondary reference such as data sheet D14 or guide D16a or handbook D28.

Inventive step - Document D26 as closest prior art

There is no difference between the disclosure of document D26 and granted claim 1. Therefore, the objective technical problem is the provision of an alternative which does not involve any improvement.

Document D26 discloses the combination of a 180°C first pre-preg resin material with RTM-6 as the second infused resin material. Document D26 is silent on the specific curing temperature of RTM-6. It does not involve an inventive step to obtain the data sheet D14 for RTM-6, and to recognize that document D26 discloses the combination of a higher temperature cure second pre-preg resin material having a specification curing temperature of 180°C with a lower temperature cure first infused resin material having a specification curing temperature of 160°C, and to further recognize that RTM-6 because it is an epoxy resin and will generate heat during exothermic curing thereby raising the temperature of the first pre-preg resin to a temperature closer to its specification curing temperature of 180°C.

The subject-matter of granted claim 1 does not involve an inventive step having regard to the combination of document D26 with data sheet D14.

IX. The arguments of the respondent in the written and oral proceedings can be summarised as follows:

Added subject-matter

Granted claim 1 comprises the combination of claims 1, 3 and 4 of the application as filed with a clarification that the infusing step is carried out "*by vacuum assisted resin transfer moulding*" for which support can be found throughout the description.

Understanding the term "temperature curing range" used in the claims

Data sheets such as D7, D8, D9, D10, D13 and D14 set out the mechanical properties a resin can achieve when fully cured at the specified curing temperatures. The skilled person will select a given material for its properties. In consequence, he will also cure the resin system as indicated in the corresponding data sheet to obtain those properties.

To the person skilled in the art of making such fibre-reinforced composite mouldings and structures, the structural portions formed from respective layers of fibrous reinforcing material and cured resin material must have the prescribed mechanical properties. To achieve these the resin material must be substantially fully cured in accordance with the curing temperature ranges disclosed in the data sheets of such thermosetting resins.

In the method of the present invention, the first and second resin materials must each achieve this property in the context of the specific curing steps. The relationship between the respective curing temperature ranges and the relationship to the curing temperature, is set out in features (8) and (10) to (12) of granted claim 1.

Sufficiency of disclosure

The skilled person has no difficulties in applying the teaching of paragraphs [0018] and [0074] of the patent in suit. Determining the respective curing temperature ranges only requires the skilled person to consult the data sheets of the selected resins. The invention is thus disclosed in a manner sufficiently clear and complete to enable it to be carried out by the skilled person.

Admissibility of late filed documents

Should the board maintain and confirm its preliminary opinion as set out in the annex to the summons to oral proceedings, the admissibility of the lated filed documents is no longer contested.

Novelty - document D5

Although late filed submissions D30 to D32 disclose that an article was provided on the CD ROM of the conference, there is no evidence that paper D5 as filed during these proceedings corresponds to that version of that article: It is still doubtful whether paper D5 is prior art.

The contested decision (point 5.2.6) is correct in that paper D5 does not disclose that:

- the second infused resin material (RTM 6) has a curing temperature range that is lower than the curing temperature range of the first pre-preg resin material (pre-preg resin 6376), and
- the curing of the second resin material raises the temperature of the first resin material to within the curing temperature range of the first resin material.

These resins are not disclosed together in combination in paper D5 and "*even if, for the sake of argument, [data sheets] D13 and D14 were to be read together, objectively D13 and D14 collectively teach that the second, infusion, resin has a higher (180°C) curing temperature range than the first, pre-preg, resin (175°C)*" (Response 27 July 2015, paragraph 68). This is the exact opposite of the relationship required in feature (10) of claim 1 as granted.

In addition neither the VARTM process of feature (7) nor the simultaneous curing of feature (8) are directly and unambiguously disclosed in a single embodiment in paper D5.

The subject-matter of claim 1 as granted is thus novel with respect to paper D5.

Novelty - paper D20

Paper 20 does not directly and unambiguously disclose a combination of the Fiberite 977-2 resin (data sheet D21) together with RTM-6 (data sheet D14). If, for the sake of argument, data sheets D21 and D14 were to be read together with paper D20, these data sheets

collectively teach that the second, infusion, resin has a higher (180°C) curing temperature range than the first, pre-preg, resin (177°C). This is the exact opposite of the relationship required in feature (10) of claim 1 as granted.

VARTM is a fixed term in the art of composite manufacture and paper D20 does not disclose feature (7), because the RTM-6 resin is injected with a pressure of 0.4 MPa, which pressure will pressurize the pre-preg (section 9): Such a pressurizing effect requires a positive pressure, not a negative pressure, and so the injection is not under vacuum and there is no VARTM process. The earlier reference in section 9 of paper D20 to "*applying a vacuum to the mould for 3 h*" refers to removal of residual air prior to heating the mould and subsequent injection under a positive pressure, and does not refer to any vacuum resin infusion process.

The subject-matter of claim 1 as granted is thus novel with respect to paper D20.

Novelty - document D22

Document D22 does not disclose any of features (8), (10) or (12) of claim 1 as granted: The curing properties, temperature ranges or values or composition of the pre-preg resin and the infused resin are not specifically disclosed. In consequence, features (10) and (12) cannot be derived directly and unambiguously from document D22.

Paragraphs [0029] and [0030] concerning the 300 to 400°F curing cycle do not disclose that there is at least partially simultaneous curing of the first pre-preg resin and the second infused resin. The pre-preg

resin could plausibly have fully cured before curing of the infused resin since the pre-preg would be preheated by preheating the tool base to 250 +/- 50°F as disclosed in paragraph [0029]. Feature (8) is not disclosed.

The arguments of the appellant, that feature (10) may be disregarded and that the second part of feature (12) may be disregarded, are erroneous as already discussed above. The novelty attack is based upon a false premise.

Features (8), (10) and (12) of claim 1 are not disclosed in document D22, so that claim 1 as granted is novel over document D22.

Novelty - document D26

There is no objective disclosure in document D26 of the provision of the infusion resin and pre-preg resin with their respective curing temperature ranges as required by claim 1. Although a "*RTM 6*" infusion resin is disclosed as an example, there is no disclosure of a curing temperature range for the infusion resin. Although a typical 180 °C pre-preg system is disclosed as an example, there is no disclosure of a curing temperature range for the pre-preg resin. Since there is no disclosure of the curing temperature ranges of either of these resins, there is no disclosure that a curing temperature range for the infusion resin is lower than a curing temperature range for the pre-preg resin.

The content of the data sheet D14 is not part of the disclosure of document D26. Data sheet D14 discloses that the RTM 6 resin is a "*180°C epoxy System*" (title)

and does not disclose that the curing temperature of the RTM 6 resin is 160 °C as alleged by the appellant.

Since data sheet D14 discloses that RTM 6 resin is a "*180°C epoxy system*" and the document D26 discloses that a typical 180°C pre-preg system may be used, there is only a disclosure of the same curing temperature for both the RTM 6 infusion resin and the pre-preg resin.

Thus there is no disclosure of feature (10) of claim 1.

Instead document D26 discloses curing both resins at a temperature which is typically 160 to 180°C (paragraph [0039]). Therefore there is no disclosure of feature (12) because the curing temperature is selected to be at or above the curing temperature of both resins.

Thus there is no disclosure of features (10) and (12) of claim 1, so that claim 1 as granted is novel over document D26.

Inventive step - Paper D5 as closest prior art

Features (7), (8), (10), (11) and (12) of granted claim 1 are not disclosed in paper D5.

The mere disclosure in data sheets D13 and D14 of properties of particular individual resins that are exemplified in paper D5, although not in combination in a single embodiment, cannot hint at the present invention, in particular the combination of features (8), (10) and (12).

According to the patent in suit (paragraphs [0018], [0025] to [0030], [0036] and [0126]) the method provides the technical effects of an increased cure

rate of the pre-preg resin, a lower overall cure temperature within the mould, the use of a lower temperature/cost moulding tool so that a high curing temperature (e.g. 70 to 90°C) pre-preg resin can nevertheless be used in a low cost tool which normally can only be used at lower temperature (e.g. 20 to 40°C) without damaging the tool or slowing down the cure rate and so increasing moulding production time.

The objective technical problem starting from paper D5 is to provide a method of manufacturing a fibre-reinforced composite moulding which can provide an overall cure temperature within a mould to permit a lower temperature/cost moulding tool to be employed for moulding a higher curing temperature pre-preg resin without damaging the tool or slowing down the cure rate and so increasing moulding production time.

Paper D5 does not remotely hint at the use of the two different temperature curing resins and the temperature control as required by features (10) and (12) of granted claim 1.

The two individual data sheets of D13 and D14 do not hint at the technical solution, which requires not only selection of specific infusion and pre-preg resins with specifically differentiated curing temperature ranges, but also control of an applied curing temperature so that the exothermic heat from the curing of the infusion resin raises the temperature of the pre-preg resin within its respective curing temperature range. Data sheets D13 and D14 do not hint at this technical temperature relationship which would require a modification of the curing process of paper D5.

The appellant has wrongly formulated the objective technical problem and has wrongly construed features (10) and (12) of granted claim 1. Claim 1 does not require "*speeding up*" the cure of the pre-preg resin but rather raising the temperature of the pre-preg resin within its respective curing temperature range.

The correctly formulated technical problem is not solved merely by arbitrarily choosing the RTM 6 infusion resin of the data sheet D14 and the 6376 pre-preg resin of the data sheet of D13.

There is no hint in paper D5, alone or with data sheets D13 or D14, to address or solve the objective technical problem starting from paper D5 as specified above. Furthermore, there is no hint to modify the process of paper D5 to achieve the technical solution claimed.

The subject-matter of granted claim 1 involves an inventive step over paper D5 alone or the combined disclosures of paper D5 and data sheets D13 and D14.

Inventive step - Paper D20 as closest prior art

As already argued, paper 20 does not disclose features (7), (10) and (12) of granted claim 1 and document D22 does not disclose features (8), (10) and (12). In consequence, even if the skilled person were to combine paper 20 and document D22, he could not arrive at the subject-matter of claim 1 as granted.

The subject-matter of granted claim 1 involves an inventive step over paper D20 combined with document D22.

Inventive step - Document D1 as closest prior art

Features (6) (applying a vacuum) and (7) (VARTM) of granted claim 1 are not disclosed in document D1 as the chemically activated resin must be injected quickly under pressure. Feature 10 (lower curing temperature range) of granted claim 1 is not disclosed in document D1, since the injected resin is a chemically activated resin and thus not a heat curing resin. The injected resin of document D1 has no "*curing temperature range*" and no relationship of such a range to that of the pre-preg resin. Furthermore, the chemically fast curing pressure injected resin of document D1 into a heated and insulated mould is not suitable for a VARTM process, which involves a "*one-sided*" VARTM mould, which would lose heat on the side having the flexible film, using slow vacuum infusion at a low temperature to avoid premature curing of the injected resin - particularly when moulding large parts - and a subsequent slow ramp up to a curing temperature.

The subject-matter of granted claim 1 involves an inventive step over document D1 combined with general knowledge or any of textbook D18 or guide D16a.

Inventive step - Combination of paper D5 and document D1

With respect to the appellant's inventive step relying upon the "*combination of D5 with D1*" it is not clear which document is alleged to be the closest prior art document (it is possible that it is intended to be paper D5). The appellant has not formulated an objective technical problem and has not used a correct problem-solution approach.

As already argued, paper D5 does not disclose the use of two different temperature curing resins and the temperature control as required by features (10) and (12) of claim 1.

Document D1 neither hints at a selecting infusion and pre-preg resins with particular curing temperature ranges, nor at controlling the curing temperature so that exothermic heat from the curing of the infusion resin raises the temperature of the pre-preg resin within its respective curing temperature range. This would require a modification of the curing process of paper D5.

The contested decision (section 6.3) already found that document D1 cannot hint at modifying a VARTM process because document D1 is not concerned with a vacuum infusion process.

Therefore granted claim 1 involves an inventive step over the combined disclosures of document D1 and paper D5.

Inventive step - Document D22 as closest prior art

Features (8), (10) and (12) of claim 1 are not disclosed in document D22.

The objective technical problem starting from document D22 is to provide a method of manufacturing a fibre-reinforced composite moulding which can provide an overall cure temperature within a mould to permit a lower temperature/cost moulding tool to be employed for moulding a higher curing temperature pre-preg resin without damaging the tool or slowing down the cure rate and so increasing moulding production time.

Although the fact that epoxy resins emit exothermic heat when cured is known from guide D16a or handbook D28, none of these documents D14, D16a or D28 would hint at the provision of features (8), (10) and (12) to solve the objective technical problem starting from document D22: In document D22 it is the applied heat from the external heating system that heats the temperature of the pre-preg resin to be within its curing temperature range.

Therefore granted claim 1 involves an inventive step over the combined disclosures of document D22, D14, D16a and D28.

Inventive step - Document D26 as closest prior art

In document D26 the curing temperature is selected so that it is the applied heat from the external heating system that heats the temperature of the pre-preg resin to be within its curing temperature range.

Features (10) and (12) of granted claim 1 are not disclosed in document D26.

The objective technical problem starting from document D26 is to provide a method of manufacturing a fibre-reinforced composite moulding which can provide an overall cure temperature within a mould to permit a lower temperature/cost moulding tool to be employed for moulding a higher curing temperature pre-preg resin without damaging the tool or slowing down the cure rate and so increasing moulding production time.

Document D26 and data sheet D14 collectively teach that the second, infusion, resin has the same (180°C) curing

temperature as the first, pre-preg, resin and there is no disclosure of the different temperature ranges required by feature (10) of claim 1, and consequently no disclosure of feature (12) either in particular since the applied curing temperature extends up to 180°C.

The subject-matter of claim 1 as granted involves an inventive step having regard to the combination of document D26 with data sheet D14.

Reasons for the Decision

1. *Objection of added subject-matter*

1.1 The following features were introduced into claim 1 as filed:
- in feature (7) the text "*by vacuum assisted resin transfer moulding*", and
- features (10), (11) and (12)

to obtain claim 1 as granted (main request).

1.2 It was not contested between the parties that feature (10) corresponds to claim 3 as filed and that features (11) and (12) correspond to claim 4 as filed. The introduction of these features thus do not give rise to added subject-matter.

1.3 The parties only disagree with respect the added text "*by vacuum assisted resin transfer moulding*" (VARTM) in feature (7) of claim 1.

Page 1, lines 16 to 20 of the application as filed discloses "*vacuum assisted resin transfer moulding (also known as VARTM, resin infusion, or vacuum*

infusion) - in this method liquid resin is infused under a vacuum into a dry fibre composite, and then can cure in ambient conditions, although tools (i.e. the moulds) are usually heated to an elevated temperature between 50-90°C to speed up the curing process". This passage concerns a review of currently used wind turbine manufacturing methods (original application, page 1, beginning of paragraph 2) and thus cannot contribute to defining the invention. However, it does indicate that the skilled person is familiar with vacuum assisted resin transfer moulding (VARTM).

According to page 4, lines 1 to 16 of the application as filed, the first aspect of the invention involves in steps "*(c) applying a vacuum to the assembly*" and "*(d) infusing a flowable uncured second resin material, under the vacuum, into the at least one layer of fibrous reinforcing material*". This is similar to the language of claim 1 as filed.

On page 8, lines 11 to 19 of the application as filed the invention is further set out with respect to particular embodiments but concludes generally: "*The result is that uncured pre-pregs can be combined with a VARTM infusion process in a very efficient improved manufacturing process in which the two resins, infusion and pre-preg, can be cured together in a common curing step*".

This is also confirmed by the general requirements concerning the "*structural infusion resin*" whose viscosity and low reactivity at the infusion temperature must be such as to allow full impregnation of the dry fibrous reinforcement layers under vacuum conditions (application as filed, page 26, lines 4 and 5 and last paragraph; page 27, second full paragraph).

Finally, the use of VARTM methods in general is explicitly contemplated in the context of generic preferred embodiments (page 33, penultimate paragraph).

In consequence, the skilled person considering the disclosure of the application as filed as a whole necessarily concludes directly and unambiguously, that the method of the invention may involve vacuum assisted resin transfer moulding VARTM. Limiting the subject-matter of granted claim 1 to VARTM thus does not add subject-matter.

The appellant's approach seeking to demonstrate alleged missing essential technical features limiting the invention based on particular embodiments fails, because the application as filed provides a basis - as set out above - for the more general language of granted claim 1. Thus the invention is not necessarily limited to an ambient curing infusion resin system as alleged by the appellant.

Furthermore, the understanding of a common curing step for the first and second resin materials as advanced by the appellant is not compatible with the description as a whole according to which "*the curing of the second resin material is exothermic and generates heat to raise the temperature of the first resin material to within the curing temperature range of the first resin material*" (application as filed, page 4, last paragraph) so that the application repeatedly indicates that "*the first and second resin materials […] hav[e] been cured at least partially simultaneously*" (application as filed, page 7, middle paragraph - underlining by the board; page 4, paragraph (e); page 22, second

paragraph; page 27, second full paragraph; claims 1 and 35).

Therefore, the subject-matter of claim 1 as granted does not extend beyond the original application underlying the patent in suit.

2. *Understanding the term "temperature curing range" as used in the claims*

The appellant's approach - which seeks to identify the term "*temperature curing range*" as an absolute property of the resins - does not take into account that the claimed method concerns the manufacture of a fibre-reinforced composite moulding which has to exhibit certain mechanical properties. The skilled person will select a given material for its properties and in consequence, will also cure the resin system according to the temperature ranges indicated in the corresponding resin manufacturers' data sheets to obtain these properties. Contrary to the appellant's argument, a skilled person has no reason to cure a resin system outside the recommended temperature range of its data sheet in order to obtain a material with inferior properties, instead of, say, curing a lower grade material for its optimal properties.

In the context of the claimed method for manufacturing a fibre-reinforced composite moulding, the "*temperature curing range*" of the resins is thus defined. In addition, the required relationship between the respective curing temperature ranges of the resins is defined in features (8) and (10) to (12) of granted claim 1.

In consequence:

- feature (10) of granted claim 1 ("*wherein the second infused resin material has a curing temperature range that is lower than the curing temperature range of the first pre-preg resin material (801)*") is not meaningless, because the skilled person will select the resins and their curing temperatures accordingly, e.g. by using the corresponding data sheets;
- feature (11) ("*the curing step is carried out at a temperature within the curing temperature range of the second infused resin material*") states that the "*second infused resin material*" is cured to achieve its design properties;
- feature (12) ("*the curing of the second resin material is exothermic and generates heat to raise the temperature of the first resin material (801) to within the curing temperature range of the first resin material (801)*") indicates that the skilled person has to ensure that the exothermic effect of curing the second material raises the temperature of the first resin material to within its curing temperature range; and
- feature (8) ("*curing the first and second resin materials at least partially simultaneously to form the fibre-reinforced composite moulding*") indicates the consequence of the method steps 10, 11 and 12, namely, that the first and second resin materials are at least partially cured simultaneously.

3. *Sufficiency of disclosure*

In view of point 2. above, determining the respective curing temperature ranges only requires the skilled person to consult the data sheets provided by the resins manufacturers. The curing temperature ranges of the resins thus do not constitute ill defined para-

meters nor do they place an undue burden on the skilled person.

Furthermore, the skilled person merely has to select two resin materials which can be at least partially simultaneously cured to form the fibre-reinforced composite moulding, such that the (exothermic) curing step of the second infused resin material raises the temperature of the first resin material to within the curing temperature range of the first resin material. No reasons were given why this should not be possible for the skilled person, given the understanding of "*curing temperature range*" set out in point 2. above.

The appellant's additional argument, that the skilled person cannot realise the invention, because the patent in suit fails to specify curing times and curing rates is not persuasive, because the curing times and curing rates depend on the particular geometry and materials of the fibre-reinforced composite moulding. Specifying the curing times and curing rates would not make sense without also providing these design details of the fibre-reinforced composite moulding. However, it is not necessary to provide such details with respect to an invention which only concerns curing the first and second resin materials at least partially simultaneously to form the fibre-reinforced composite moulding wherein the second infused resin material has a curing temperature range that is lower than the curing temperature range of the first pre-preg resin material and the exothermic curing of the second resin material raises the temperature of the first resin material to within the curing temperature range of the first resin material.

The appellant's further argument, that resin manufacturers do not readily make data sheets with a view to particular applications of the resin material in a composite materials application, is not persuasive, because the skilled person does not require such application specific data sheet to select a material for its fully cured properties from conventional data sheets as supplied by resin manufacturers.

In consequence, the subject-matter of claim 1 is sufficiently disclosed for the skilled person to realise the invention.

4. *Novelty (article 54 EPC)*

4.1 Paper D5

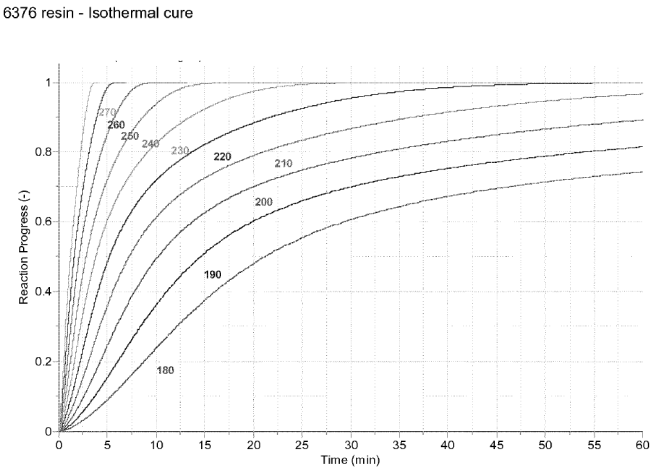
4.1.1 Scientific paper D5 investigates a manufactured component consisting of a pre-impregnated area and an injected area and discloses that the use of two different resin systems in such hybrid manufacturing is indispensable (page 3, section "*2 Hybrid Fabrication*"). Component demonstrators were manufactured and tested (page 7, section "*3 Component demonstrators*").

Paper D5 is silent about the curing temperature ranges of the two resin materials and does not disclose that the heat generated by (exothermic) curing of the second resin material raises the temperature of the first resin material to within the curing temperature range of the first resin material.

4.1.2 Although late filed submissions D30 to D32 demonstrate that an article with the same title and authors was provided on the CD ROM of the conference, there is no evidence that paper D5 as filed during the proceedings

before the EPO corresponds to that version of the article. Paper D5 is thus not necessarily prior art.

The appellant further refers to D27, labelled "*6376 resin - isothermal cure*" which only consists of curves describing the "*reaction progress*" with respect to time for various temperatures between "*180*" and "*270*" for a "*6376 resin*":



There are no indications in graph D27 concerning the curing temperature range of the "*6376 resin*" needed to achieve certain properties of the thus cured resin. However, such information is needed by the skilled person in order to select a resin suitable for his intended purpose and is typically found in the resin data sheet. Graph D27 thus does not contribute any useful information for assessing the novelty of the subject-matter of claim 1.

4.1.3 Although paper D5 refers to pre-preg resin 6376 as an example (page 3, left hand column) this cannot be a reference to data sheet D13, because the latter is dated March 2007, i.e. after the alleged publication date of paper D5. Furthermore, document D5 does not explicitly reference data sheet D14 either.

Data sheet D14 discloses "*HexFlow® RTM6 180°C epoxy system for Resin Transfer Moulding monocomponent system Product Data*" (title) and data sheet D13 discloses "*HexPly® 6376 175°C curing epoxy matrix Product Data*" (title). Even if, for the sake of argument, data sheets D13 and D14 were to be read together with paper D5, the second, infusion, resin ("*HexFlow® RTM6 180°C epoxy system*") has a higher (180°C) curing temperature range than the first, pre-preg, resin ("*HexPly® 6376 175°C curing epoxy matrix*")(175°C). This is the exact opposite of the relationship required in feature (10) of claim 1 as granted.

4.1.4 Even if paper D5 were clearly part of the prior art, there is thus no direct and unambiguous disclosure of features (10) and (12) of granted claim 1. Already for this reason the novelty of the subject-matter of claim 1 as granted cannot be anticipated by paper D5 - even if paper D5 were proven to be prior art (article 54 EPC).

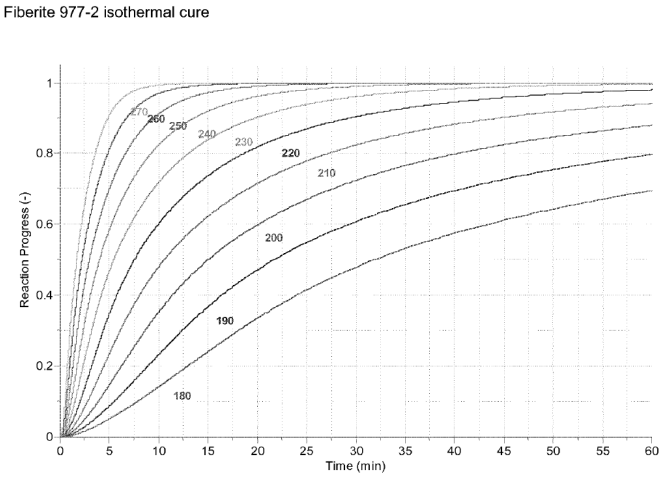
4.2 Paper D20

4.2.1 Scientific paper D20 concerns the development of a composite cargo door for an aircraft (title), involves making stiffeners and reinforcements from pre-preg and using the pressure of the RTM resin during the RTM process to pressurise the pre-preg (page 814, right hand column, lines 12 to 15). RTM-6 epoxy resin is used in combination with "*Fiberite HMF carbon 977-2A-35-6KHTA-5H-370-T2*" pre-preg (page 815, left hand column), the pressure of the RTM process is 0.4 MPa and the pressure of the RTM-6 will pressurise the pre-preg (page 816, left hand column, last 4 lines; page 817, right hand column, 11th bullet point). The fabrication concept of paper D20 involves curing the pre-preg and

the infused skin laminate at 160°C for 4h (page 817, right hand column, 3rd last bullet point).

4.2.2 Paper 20 does not directly and unambiguously disclose a combination of the Fiberite 977-2 resin of data sheet D21 together with RTM-6 of data sheet D14. Data sheet D21 concerns 977-2 Epoxy resin from ICI Fiberite and discloses that Fiberite® 977-2 is a 177°C curing toughened epoxy resin (page 1, right hand column, first 2 lines). If, for the sake of argument, data sheets D21 and D14 were to be read together with paper D20, these data sheets indicate that the second, infusion, resin RTM-6 has a higher (180°C - see title) curing temperature range than the first, pre-preg, resin Fiberite® 977-2 (177°C). This is the exact opposite of the relationship required in feature (10) of claim 1 as granted.

The appellant further referred to graph D25 which only consists of curves describing the reaction progress with respect to time for various temperatures between "*180*" and "*270*" for "*Fiberite 977-2*":



There are no indications in graph D25 concerning the curing temperature range of "*Fiberite 977-2*" needed to achieve certain properties of the thus cured resin. However, such information is needed by the skilled

person in order to select a resin suitable for his intended purpose and is typically found in the resin data sheet. Graph D25 thus does not contribute any useful information for assessing the novelty of the subject-matter of claim 1.
Paper D20 is silent about the curing temperature ranges of the two resins and thus does not disclose that the heat generated by (exothermic) curing of the second resin material raises the temperature of the first resin material to within the curing temperature range of the first resin material.

4.2.3 Thus paper D20 does not disclose the following features of granted claim 1:

- feature (7): vacuum assisted resin transfer moulding, because the resin is injected into the mould under pressure,
- feature (10): the second infused resin material has a curing temperature range that is lower than the curing temperature range of the first pre-preg resin material, and
- feature (12): the curing of the second material raises the temperature of the first resin material to within the curing temperature range of the first resin material.

The subject-matter of granted claim 1 is thus new with respect to paper D20 (article 54 EPC).

4.3 Document D22

Document D22 concerns a co-cured resin vacuum-assisted transfer molding manufacturing method (paragraph [0002]): The tool base may be at room temperature or heated to 121°C ±10°C (250°F ±50°F) while the resin is infused (paragraph [0029]). Thereafter the curing cycle

is started by heating the tool base to a higher temperature of 149°C to 204°C (300°F to 400°F) and held for a predetermined time to help cure the two resins and join them together (paragraph [0030]).

Since document D22 neither discloses the curing temperature ranges nor the compositions of the pre-preg and infused resins, features (10) and (12) cannot be directly and unambiguously derived therefrom. Contrary to the appellant's position, these features are meaningful (see point 2. above) and already serve to distinguish the subject-matter of granted claim from document D22.

The subject-matter of claim 1 as granted is thus novel over document D22.

4.4 Document D26

Document D26 concerns a method of manufacturing a fibre-reinforced composite moulding comprising a pre-preg and a dry fibre component (paragraph [0001]).

Document D26 discloses that: "*After a time determined, by the resin systems (typically 1 to 2 hours) a heating of chambers B and C takes place in the curing phase 103 that has to be designed so that the temperatures are sufficient for the final curing of the resin system (typically 160 to 180°C, approx. 1-2 hours). If it is advantageous for one of the resin systems, an additional tempering (thermal after treatment) takes place at, e.g., 180-210°C*" (paragraph [0039]) and "*The method parameters cited above are given by way of example for a typical 180°C pre-preg system in combination with a liquid resin system*" (paragraph [0041]). Document D26

discloses that the injection resin could be RTM 6 (paragraph [0036]).

Contrary to the appellant's position, features (10) and (12) of granted claim 1 are meaningful (see point 2. above) and must be considered in the examination for novelty and inventive step.

Thus although a "*RTM 6*" infusion resin is disclosed as an example, there is no disclosure of a curing temperature range for the infusion resin. Although a typical 180°C pre-preg system is disclosed as an example, there is no disclosure of a curing temperature range for the pre-preg resin. Since there is no disclosure of the curing temperature ranges of either of these resins, there is no disclosure that a curing temperature range for the infusion resin is lower than a curing temperature range for the pre-preg resin. Thus there is no disclosure of feature (10) of claim 1.

The content of the data sheet D14 is not part of the disclosure of document D26. Data sheet D14 discloses the RTM 6 resin as a "*180°C epoxy System*" (title) and does not disclose that the curing temperature of the RTM 6 resin is 160°C as alleged by the appellant, because the RTM 6 resin requires further curing at 180°C (page 4) - which explains the title of the data sheet.

In consequence, even if document D26 and data sheet D14 were to be considered together, they disclose that the "*RTM 6 180°C epoxy system*" (data sheet D14) and the "*typical 180°C pre-preg system*" (document D26) cure at the same temperature. There is thus no disclosure of the different temperature ranges required by feature

(10) of claim 1, and consequently no disclosure of feature (12) either.

Instead document D26 explicitly discloses curing both the infusion and pre-preg resins at a same temperature which is typically 160 to 180°C (paragraph [0039]), which implies that the temperature is selected to be at or above the curing temperature of both resins. Although paragraph [0039] indicates a range for the required curing temperature, this does not necessarily imply that the temperature will traverse the range during curing.

Thus features (10) and (12) of granted claim 1 are not disclosed in document D26 so that the subject-matter of granted claim 1 is new with respect to document D26.

5. *Inventive step (article 56 EPC)*

5.1 Paper D5 as closest art

The subject-matter of claim 1 as granted differs from the disclosure of paper D5 (even if it were proven to be prior art) in terms of features (10) and (12) of granted claim 1 (point 4.1 above).

These features make curing more energy efficient (paragraph [0018] of the patent in suit).

The corresponding objective problem is thus to increase the energy efficiency of the method of manufacturing a fibre-reinforced composite moulding.

Even if, for the sake of argument, data sheets D13 and D14 were to be read together with paper D5, the second, infusion, resin ("*HexFlow® RTM6 180°C epoxy system*")

has a higher (180°C) curing temperature range than the first, pre-preg, resin ("*HexPly® 6376 175°C curing epoxy matrix*")(175°C). This is the exact opposite of the relationship required in feature (10) of claim 1 as granted.

There is no indication in D5 or in the data sheets D13 and D14 of a solution in terms of features (10) and (12) (point 4.1 above).

Even if paper D5 were clearly part of the prior art, features (10) and (12) of granted claim 1 are not disclosed or suggested either in paper D5 alone or in paper D5 in combination with the data sheets D13 and D14.

Even if paper D5 were clearly part of the prior art, the subject-matter of granted claim 1 involves an inventive step over paper D5 alone or the combined disclosures of paper D5 and data sheets D13 and D14 (article 56 EPC).

5.2 Paper D20 as closest prior art

Neither paper 20 nor document D22 disclose features (10) and (12) of granted claim 1 (points 4.2 and 4.3 above). Even if the skilled person were to consider a combination of paper D20 and document D22, he could not arrive at features (10) and (12) of granted claim 1.

In consequence, the subject-matter of granted claim 1 involves an inventive step over paper D20 combined with document D22 (article 56 EPC).

5.3 Document D1 as closest prior art

Document D1 uses an insulated preferably heated (65°C - 150°F) two part mould into which the resin in injected under pressure (column 2, lines 3 to 7): "*Chemically activated thermosetting resin such as polyester resin with conventional catalysts, promoters, and initiators as additives is then injected under pressure through a nozzle 36 and an aperture 20c in the upper mold portion 20b, to impregnate the plies 22, 24, 30, and 32.*" "*The heat given off by the chemically activated resin initiates curing of the resin of the core 26*" (column 2, lines 9 to 14 and 16 to 18).

Document D1 thus injects a chemically activated resin under pressure and does not disclose a VARTM. The chemically activated resin does not have a curing temperature range, since its curing is chemically activated (and it is injected under pressure to prevent it from setting before the mould is filled).

The subject-matter of granted claim 1 thus differs from document D1 in features (6), (7) and (10).

The skilled person starting from document D1 would have to carry out two steps in that the second infused resin must be replaced by a heat curing resin material which has a curing temperature range that is lower than the curing temperature range of the first pre-preg resin material and replacing the resin injection moulding of document D1 by a VARTM.

Textbook D18 or guide D16a do not alter this conclusion, since they were only cited to illustrate common general knowledge concerning the different resin transfer methods.

In consequence, the subject-matter of granted claim 1 involves an inventive step with respect to document D1 (article 56 EPC).

5.4 Combination of paper D5 and document D1

With respect to the appellant's arguments concerning the "*combination of D5 with D1*", it is not clear which document is considered to be the closest prior art document (if paper D5 were proven to be prior art). Furthermore, the appellant has not formulated an objective technical problem and has not used the problem-solution approach.

The appellant considers that "*a skilled reader would understand that of course the same combinations of resins can be used in RTM and VARTM*". Therefore, even if the skilled person were to read across between document D1 and paper D5, he would use the resins of document D1 in the process of paper D5.

However, this would not result in the subject-matter of claim 1 as granted, because document D1 involves a chemically cured infusion resin and not one which has a curing temperature range and in particular, not one with a curing temperature range which is lower than the curing temperature range of the first pre-preg resin material - see feature (10) of claim 1.

Conversely, using the resins of paper D5 in the process of document D1 would not result in the subject-matter of granted claim 1 either, because paper D5 does not disclose features (10) and (12) of granted claim 1 (see point 4.1 above).

In consequence, the subject-matter of granted claim 1 involves an inventive step with respect to the combination of document D1 and paper D5 (article 56 EPC).

5.5 Document D22 or D26 as closest prior art

Neither of documents D22 of D26 discloses features (10) and (12) of granted claim 1 (points 4.3 and 4.4 above).

The subject-matter of granted claim 1 differs from the disclosure of each one of documents D22 and D26 in terms of features (10) and (12), because neither the curing temperature ranges nor the compositions of the pre-preg and infused resins can be directly and unambiguously derived therefrom.

The skilled person starting from either document D22 or D26, would only learn from data sheet D14 that RTM 6 is an "*180°C epoxy system for Resin Transfer Moulding*" (title) and from guide D16a and/or handbook D28 that epoxy resins emit exothermic heat when cured. Neither data sheet D14 nor guide D16a nor handbook D28 hint at the provision of features (8), (10) and (12) starting from either document D22 or D26. In consequence the information from data sheet D14, guide D16a and handbook D28 is not sufficient to arrive at the subject-matter of granted claim 1.

The subject-matter of claim 1 as granted involves an inventive step having regard to the combination of either one of documents D22 and D26 with any of data sheet D14, guide D16a and/or handbook D28.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

N. Schneider P. Lanz

Decision electronically authenticated