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Datasheet for the decision of 21 July 2010

Case Number: T 1989/08 - 3.2.04

Application Number: 02718362.3

Publication Number: 1392960

IPC: F02M 25/00

Language of the proceedings: EN

Title of invention:
Process for dosing an additive into a fuel

Patentee:
Innospec Limited

Opponent:
Infineum International Ltd., IP Law Dept.
Pirelli & C. Eco Technology S.p.A.

Headword:
-

Relevant legal provisions:
EPC Art. 52(1), 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Inventive step (no) (all requests)"
"Remittal (no)"
"Technical prejudice (no)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1989/08 **-** 3.2.04

D E C I S I O N
of the Technical Board of Appeal 3.2.04
of 21 July 2010

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 1 August 2008 concerning maintenance of European patent No. 1392960 in amended form.**

Composition of the Board:

Chairman: M. Ceyte
Members: A. de Vries
C. Heath

Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal, received 9 October 2008, against the interlocutory decision of the Opposition Division posted 1 August 2008 on the amended form in which European Patent No.1 392 960 can be maintained. He simultaneously paid the appeal fee. The statement setting out the grounds followed on 9 December 2008.

The Proprietor also filed an appeal, but this he withdrew unconditionally with letter of 14 July 2010.

II. Opposition was filed against the patent as a whole and based among others on Article 100 (a) together with Articles 52(1) and 56 EPC 1973, for lack of inventive step.

The Opposition Division held that the grounds for opposition under Article 100 EPC 1973 did not prejudice the maintenance of the patent as amended according to a main request having regard to the following documents inter alia:

D1: US-A-4 662 327

D5: WO-A- 99/36488

D9: B.Wiedemann e.a.: "Application of Particulate Traps and Fuel Additives for Reduction of Exhaust Emissions", SAE Technical Paper Series, Nr. 840078

D10: B.Wiedemann e.a.: "Vehicular Experience with Additives for Regeneration of Ceramic Diesel Filters", SAE Technical Paper Series, Nr. 850 817

D12: US-A-6 068 672

D13: DE-C2-43 32 933.

III. On 21 June 2010 a third party filed a notice of intervention under Article 105(1)(b) EPC, simultaneously paying the required opposition fee and submitting the required reasoned statement.

IV. Oral proceedings were held before this Board on 21 July 2010.

V. The Appellant (Opponent) requests that the decision under appeal be set aside and the patent be revoked in its entirety.

The intervening party also requests setting aside of the decision and revocation of the patent in its entirety.

The Respondent (Proprietor) requests as preliminary request that the case be remitted to the department of first instance, or, should the case not be remitted, that the patent be maintained on the basis of claims according to a main request, or, one of auxiliary requests 1a, 1b, 1c, 1d, 2, 3 or 3a all filed with letter of 16 July 2010.

VI. The wording of claim 1 of the requests is as follows:

Main request

"A process for dosing a fuel with a fuel additive comprising
(i) passing the fuel from a fuel container through a dosing apparatus to a combustion chamber, wherein combustion gases produced in operation pass through an

exhaust system comprising a retrofitted diesel particulate filter
(ii) dosing the fuel with additive in an amount based on the fuel passing through the dosing apparatus and independently of the concentration of the additive in the fuel
(iii) returning a portion (“the returned portion”) of the fuel to the container;
wherein the fuel additive is capable of catalysing the regeneration of the diesel particulate filter;
wherein the fuel additive is or comprises a metal,
wherein the metal is selected from iron, strontium, calcium, cerium, sodium, platinum, copper, manganese and mixtures thereof;
wherein the dosing apparatus is situated anywhere along the path of the fuel from the fuel container to its return to the container;
wherein as the container level falls, repeated dosing of fuel gradually increases the additive concentration."

Auxiliary Request 1a

"A process for dosing a fuel with a fuel additive comprising
(i) passing the fuel from a fuel container through a dosing apparatus
(ii) dosing the fuel with additive in an amount based on the fuel passing through the dosing apparatus and independently of the concentration of the additive in the fuel
(iii) returning a portion (“the returned portion”) of the fuel to the container;

wherein combustion gases produced in operation pass through an exhaust system comprising a retrofitted diesel particulate filter;
wherein the fuel additive is capable of catalysing the regeneration of the diesel particulate filter;
wherein the fuel additive is or comprises a metal,
wherein the metal is selected from iron, strontium and cerium and mixtures thereof;
wherein the dosing apparatus is situated anywhere along the path of the fuel from the fuel container to its return to the container;
wherein as the container level falls, repeated dosing of fuel gradually increases the additive concentration;
wherein soot storage in the diesel particulate filter is followed by periodic combustion or regeneration."

Auxiliary Request 1b

Claim 1 is as in *auxiliary request 1a* but for the insertion of the following penultimate feature in the claim:
"wherein when the container is nearly empty, the additive level in the fuel has reached very high levels relative to the case when the container is full;"

Auxiliary Request 1c

Claim 1 is as in the *auxiliary request 1b* but for the following amendments (emphasis added by the Board to highlight changes):

– the feature immediately following feature (iii) now reads "**wherein the non-returned portion is passed to a combustion chamber,** wherein combustion gases ....";

– the following feature now reads: "wherein the fuel additive **catalyses, in use** the regeneration ...."; and
– the last feature but two now reads "wherein as **the level of fuel in the container** falls ....".

Auxiliary Request 1d

Claim 1 is as in the *auxiliary request 1c* but for the following in amendments:

– the feature immediately following on feature (iii) is replaced by the following feature: "wherein the vehicle is retrofitted with a diesel particulate filter"; and
– the third feature following on feature (iii) is limited to iron and thus reads: "wherein the fuel additive is or comprises iron".

Auxiliary Request 2

Claim 1 is as in the main request but for the following amendments:

– addition of a new final feature that reads: "wherein soot storage in the diesel particular filter is followed by periodic combustion or regeneration"; and
– insertion immediately preceding the (now penultimate) feature "wherein as the container level falls ..." of a further new feature that reads "wherein immediately after refuelling, the concentration of fuel additive in the fuel is very low;".

Auxiliary Request 3

"Use, for the purpose of dosing a fuel and catalysing the regeneration of a retrofitted diesel particulate filter, of a combustion engine and exhaust system comprising a fuel storage container configured to pass fuel in operation from the container to a combustion chamber via an additive dosing apparatus, wherein a portion ("the returned portion") of the fuel is returned to the container and wherein combustion gases produced in operation pass through the exhaust system comprising the filter, wherein the dosing apparatus is configured to dose the fuel with additive in an amount based on the fuel passing through the dosing apparatus and independently of the concentration of the additive in the fuel:
wherein the fuel additive catalyses the regeneration of the diesel particulate filter;
wherein the fuel additive is or comprises a metal,
wherein the metal is selected from iron, strontium, calcium, cerium, sodium, platinum, copper, manganese and mixtures thereof;
wherein the portion of the fuel returned to the container is at least 80% of the fuel passing through the dosing apparatus;
wherein as the container level falls, repeated dosing of fuel gradually increases the additive concentration;
wherein soot storage in the diesel particulate filter is followed by periodic combustion or regeneration.

Auxiliary Request 3a

"Use, for the purpose of dosing a fuel and catalysing the regeneration of a retrofitted diesel particulate

filter, of an additive dosing apparatus provided in a combustion engine and exhaust system which comprises a fuel storage container configured to pass fuel in operation from the container to a combustion chamber via said additive dosing system, wherein a portion ("the returned portion") of the dosed fuel is returned to the container, wherein combustion gases produced in operation pass through the exhaust system comprising the filter, wherein the dosing apparatus is configured to dose the fuel with additive in an amount based on the fuel passing through the dosing apparatus and independently of the concentration of the additive in the fuel;
wherein the fuel additive catalyses the regeneration of the diesel particulate filter;
wherein the fuel additive is or comprises iron;
wherein the portion of the fuel returned to the container is at least 80% of the fuel passing through the dosing apparatus;
wherein as the level of fuel in the container falls, repeated dosing of fuel gradually increases the additive concentration; and
wherein when the container is nearly empty, the additive level in the fuel has reached very high levels relative to the case when the container is full;
wherein soot storage in the diesel particulate filter is followed by periodic combustion or regeneration.

VII. As regards the decisive issues the Appellant argued as follows:

The Respondent's request for remittal is based on the assumption that the intervention may be decisive for

the case. However, the primary case for review initiated by the appellant should first be considered.

As for inventive step, D13 shows flow amount dependent dosing of in particular ferrocene as DPF (diesel particular filter) regeneration catalyzing additive into the fuel feed of diesel engines. These naturally include a return line. The only difference of retrofitting a DPF is a known measure.

Alternatively, D5 describes DPFs and various additives for regeneration but gives no detail of onboard dosing or mention retrofitting in that context. D1 offers a cheap and simple way of doing so in the return line.

A prejudice must be proven to the level of common general knowledge. A small number of specialist documents does not suffice. D10 provides a counter example.

The attacks apply also to the auxiliary requests. As for a minimal 80% return (auxiliary request 3) this is either a usual value or arbitrary.

VIII. The intervening party added the following to the Appellant's arguments:

In D10 concentration must also increase when return is high. The patent also allows for decrease.

D5 on page 20 refers to instantaneous not overall duty.

IX. The Respondent argued as follows:

The new facts and evidence submitted with the intervention as well as the length and late timing of the intervention submissions justify a remittal. The added feature of retrofitting addresses the intervention and also requires first instance consideration.

D9 to D12 document a prejudice against varying additive concentration in the fuel. Large swings prevent proper DPF functioning and may even cause damage. The skilled person will thus always strive to keep the additive concentration constant in the fuel line.

D10 for example includes a clear instruction not to contaminate the fuel tank with additive. Due to return to a separate internal chamber additive rises to static levels.

The prejudice is a bar to employing a dosage system such as D1 or D13 as this would be perceived as deleterious to the DPF. These systems would be used only in a way consistent with prejudice, if at all.

Retrofitting is a further important distinction to the invention. None of the documents show retrofitting, but rather DPFs with onboard dosing systems in factory assembled or test-bed vehicles.

Reasons for the Decision

1. The appeal is admissible.

Likewise, the intervention, filed within three months of the intervening party serving a writ of summons of 29 March 2010 on the proprietor respondent in a non-infringement suit, meets all the requirements of Rule 89 in conjunction with Rules 76 and 77 EPC and is also admissible.

2. *Preliminary Request for Remittal*

The Board agrees with the Respondent that consideration of the new case based on new evidence and brought by the intervener at this late stage would normally require postponement or possibly remittal of the case. In order not to unreasonably prejudice the position of the Appellant-Opponent, the Board finds it however expedient to deny the request for immediate remittal and initially limit consideration of the case to the legal and factual framework defined by the original appeal as lodged by the Appellant and subsequent submissions in response thereto, and without relying on any of the new evidence and facts presented by the Intervening Party or submitted responding thereto.

That claim 1 of all requests includes a feature (retrofitting) which, according to the Respondent, addresses the intervening party's case is also no impediment to the Board considering the case within the original framework of the appeal. Firstly, the Respondent cannot expect to have the Board consider amendments filed at such a late stage in the

proceedings, i.e. one week before the oral proceedings, if he is not also prepared to discuss them unconditionally at this stage of the proceedings. Both the Appellant and the Intervening Party were moreover prepared to discuss the new feature at the oral proceedings within the framework of the original appeal, and indeed have done so. Both also argued against remittal: the desire for legal certainty of these parties, who represent the public interest, must outweigh any interest the Respondent may have for a first instance consideration of what can be decided within the initial framework.

The Board was therefore justified in denying the Respondent's preliminary request for remittal. Given that it can decide the case within the framework of the original appeal, as is apparent from the reasons that follow, the question of remittal is in any case moot.

3. *Background*

The patent is concerned with the dosing of a fuel additive used as catalyst in the regenerative combustion ("regeneration" or "burn off") of soot collected in a diesel particulate filter (DPF). These additives are effective in reducing the combustion temperature of the soot, thus promoting earlier and more regular regeneration events.

According to the patent, see e.g. specification paragraphs [0016], known systems use complex electronic control to maintain constant additive level to take into account the effect of fuel return. The patent in contrast proposes a simple dosing scheme based on the

flow of fuel, independently of the concentration of additive. Due to fuel return repeated dosing of additive will result in its concentration gradually increasing in the remaining fuel, as fuel is consumed and the remaining fuel level drops. High additive levels will procure earlier regeneration under difficult conditions, in particular city operation when low exhaust temperatures make soot burn out difficult to achieve, specification paragraph [0039].

4. *Inventive Step: Main Request*

4.1 Inventive step can be assessed from a number of vantage points. Starting first from D5 as notional closest prior art, this document concerns the use of fuel additives (in composite form) for the regeneration of a particulate filter trap, in particular diesel particulate filter traps, i.e. DPFs, used in diesel engines, page 1, first and final paragraphs. Page 5, 2nd and 3rd paragraphs, mentions various types of additives, in particular iron-based and alkali or alkaline earth metal based additives. Page 17, final paragraph, refers to on-board dosing into the fuel.

4.1.1 With respect to D5 the dosing process of claim 1 differs, firstly, in the specifics of the dosing scheme as defined by features (ii) and (iii) and the final two features. Additive is thus dosed in an amount based on fuel passing through the dosing apparatus, which is situated anywhere along the fuel path from and back to the container. The final feature of claim 1, the Board notes at this juncture, merely expresses an inevitable result of the claimed dosage under fuel return, and is

of itself of no limiting significance, see also specification paragraph [0034].

A further difference over D5 is that the DPF is retrofitted, i.e. the DPF is not fitted during manufacture of the vehicle but added afterwards.

D5 does not provide detail of the particular on-board dosing scheme. Nor does it specifically mention retrofitted DPF's in that context, though it does describe test-bench retrofitting DPFs in another section (page 22, last but one paragraph).

4.1.2 The claimed dosing scheme has a "significant operational advantage" over more costly complex batch dosing systems using an electronic management system, in procuring regeneration in city operation due to higher additive concentration at low fuel levels, as explained in specification paragraphs [0038] and [0039]. It is thus simpler and results in a more effective use of additive in city operation.

The specification is silent on the particular significance of applying the dosing scheme to only retrofitted DPFs (the specification includes sections describing prior art factory fit and retrofit dosing systems, but nowhere expressly describes application to retrofitted systems). A simpler system will normally mean it is easier to fit, so that this benefit acquires added value within the context of retrofitting. Otherwise the Board can see no specific advantage in applying the scheme to only retrofitted DPFs. This feature at best therefore provides a context for the formulation of the objective technical problem. That

can then be formulated as follows: *how to realize an on-board dosing scheme that is both simple and makes effective use of additive when applying catalytic additives for DPF regeneration as in D5 in a diesel engine retrofitted with a DPF.*

The desire for simple, less costly and more effective systems is a common desire, also when retrofitting. D5, for example, recognizes the need to reduce the complexity and cost of on-board dosing, see page 21, lines 20 to 21. In any case, formulation of the above problem itself does not require any inventive insight.

4.1.3 The skilled person, here a mechanical engineer involved in the design of diesel engines, who is in search of a simple but effective way of on-board dosing additives as in D5 for retrofitted DPFs, will draw upon the relevant literature describing fuel additive dosing systems used for diesel engines.

D1, in particular, describes an additive dosing scheme that is both simple, column 2, lines 1 to 6, and results in increased additive effectiveness, at least under certain conditions, see the paragraph bridging columns 2 and 3. The general principle is described in column 2, lines 12 to 29, and involves adding the additive into the fuel return line. Dosing may be "as a function of the amount of operating agent returned", column 2, lines 59 to 64. This alternative is portrayed in the following lines as particularly beneficial for "stop-and-go operation, where brief starting processes alternate with idle stopping times", i.e. city operation. This is characterized by more return resulting in increased additive uptake and an increase

in the additive concentration in the tank, in turn producing a greater effect when it is most needed. The effect is also described in column 5, line 60, to column 6, line 4, where it is clear that accumulation in the tank is over time, i.e. as fuel level drops. D1 mentions a wide range of applications and types of additive: diesel fuel is mentioned (column 3, line 34) and agents involved in exhaust filtering.

4.1.4 The general scheme of D1 offers the skilled person the advantages he seeks, and he will adopt it as a matter of course when carrying out the teaching of D5 for on-board dosing of additive for DPF regeneration when applied to a retrofitted DPF. In so doing he arrives in straightforward manner at a process falling within the terms of claim 1.

4.2 An alternative approach departs from D13, the prior art cited in the specification at paragraph [0022]. As acknowledged there this document describes a dosing device fitted into the fuel line of a diesel engine. An example is shown in figure 2 of D13, see also page 3, lines 28 to 39, and basically comprises a T junction by which soluble solid additive 1 projects (via the slanted leg of the T) into the engine fuel supply line 5 and is so gradually dissolved by fuel flowing through. This simple scheme necessarily results in flow dependent dosing as also recognized in the specification, paragraph [0022]. The device is specifically suitable for dosing *ferrocene*, page 2, lines 47 to 61, into diesel fuel, see the examples, page 3, line 40 onwards. Ferrocene is a known iron-based additive used to catalyse the regeneration of DPFs, see D5, page 9, line 9. Diesel engines include

fuel return as expressly acknowledged in the specification, paragraph [0028]. Due to the return line, dosing in a diesel engine incorporating the flow dependent dosing device in its fuel supply line necessarily results in a gradual increase in additive content in the tank as the fuel level drops, see above.

4.2.1 The only difference of dosing according to claim 1 with respect to that as can be inferred from D13 resides in the fact that the scheme applies to a diesel engine to which a DPF is retrofitted.

4.2.2 It is incontestable that DPFs are routinely used to reduce particulate emissions in diesel engines. Equally indisputable is the fact that retrofitting DPFs (as opposed to factory fitting new vehicles) is the standard solution to reducing particulate emissions in existing diesel fuelled vehicles. It is indeed so well-known that the Board considers this measure to form part of the common general knowledge of the skilled person identified above. Applying such a measure on a diesel engine equipped with a dosing device as in D13 requires no particular inventive insight on the part of the skilled person.

4.3 The Respondent asserts that a prejudice against varying additive concentration in the fuel would dissuade the skilled person from following any of the above paths. As explained e.g. in specification paragraph [0021] complex on-board dosing control is necessary to avoid overdosing which would deplete stored additive, but also lead to an increased ash burden in the DPF.

4.3.1 The Board finds that such a prejudice has not been conclusively proven. In the jurisprudence a technical prejudice in a particular field is generally held to relate to an opinion or preconceived idea widely or universally held by experts in the field, see the Case Law of the Boards of Appeal, 5th edition, 2006 (CLBA hereinafter), I.D.9.2, page 161, final paragraph, and the case law cited therein. To demonstrate prejudice requires a high standard of proof, as is evident from the immediately following paragraphs of the cited section of the CLBA. Thus, expression of the prejudice in standard works or a textbook is normally required, raising the level of proof close to that needed for proving common general knowledge. It is for example not enough that the opinion or idea is held by a limited number of individuals or that it is a prevalent view within a given firm, however large.

4.3.2 Including evidence subsequently filed in the appeal procedure, all the evidence offered in support of the alleged prejudice, amounts to no more than 10 documents, all of which are either specialist papers or patents. This small number of publications intended for a select readership in the field is in itself a tenuous basis for asserting prejudice.

4.3.3 Importantly, none of these documents expressly indicates that variation in additive concentration should be avoided. D9, which is given special significance in proving prejudice, only instructs avoiding additive contamination in the fuel in the main tank, as does D10. Both publications, the Board notes, share an author (Wiedemann) and originate in the same firm (Volkswagenwerk AG). Even if D9 and D10 had

expressed the alleged belief, that would be a belief held in only one firm, not one prevalent across the whole breadth of the vehicle industry.

4.3.4 Moreover, some of the evidence contradicts the alleged prejudice. D10, page 15, left column under the heading "Computation of the Mn emissions", and page 18, top half, discusses a system with constant additive dosing rate (3ml/h) into the supply line. Fuel is supplied from a separate tank within the fuel tank to which excess additive rich fuel is again returned. Fuel is topped up from the remaining part of the tank to meet demand, whereas flow in the opposite direction is prevented to keep the fuel in the main tank pure. It is clear that depending on the engine operating conditions additive concentration in the separate tank (and supply and return lines) must fluctuate: low return of additive rich fuel means greater top-up with pure fuel which will decrease additive content, while high return means less top-up resulting in an increase in additive content. This is similar to the fluctuations described in the patent specification paragraph [0044], with the difference that the relative size of the separate chamber to the tank imposes greater limits on the amount of fluctuation.

4.3.5 Likewise, D1, as discussed previously, generally regards the variation of the concentration of a fuel additive in the fuel to be advantageous, in particular in stop-and-go operation, with the concentration varying between a low value for high fuel consumption and a high value for low consumption. D1 may not mention catalytic additives for DPF regeneration, but its teaching is of general scope that applies to a wide

range of additives independent of their purpose. Such a teaching surely inclines the skilled person towards, rather than away from a variation of additive concentration.

4.3.6 If any common opinion does emerge from the various citations it most likely relates to dosing at optimum levels, high enough to ensure efficient and regular DPF regeneration in all operating conditions but not so high as to consume too much additive and/or saturate the DPF, cf. D12, column 2, first paragraph, and specification paragraph [0021], or D5, page 7, final paragraph. This does not exclude variations in additive concentration, nor does it bar the skilled person continuing along any of the obvious paths described above. Mindful of such optimum dosing he will adjust various parameters - for example in the course of routine tests or trial and error - to ensure that he does not exceed optimum levels. This appears similar to the way the patent itself doses at a rate fixed at "a mean value between that ideally required for maximum and minimum fuel flows", specification paragraph [0044], lines 10 to 18.

4.4 In the light of the above the Board concludes that the dosing process defined in claim 1 of the main request lacks inventive step contrary to Article 52(1) in combination with Article 56 EPC.

5. *Inventive Step: Auxiliary Requests*

5.1 The auxiliary requests 1a, 1b, 1c, 1d and 2 in part concern amendments to claim 1 of the main request which spell out more clearly the operation of a DPF or the

way return of additive rich fuel acts to change additive levels. They are intended as clarifications only and do not effect the substance of the claim. Requests 1a to 1d also narrow down the range of metal that may be comprised in the additives from Fe, Sr and Ce (auxiliary request 1a) to only Fe (auxiliary request 1d). As both paths described above also expressly mention iron based additives, in particular ferrocene, these amendments also do not differentiate the claimed process further from the obvious combinations discussed above.

5.2 Claim 1 of the auxiliary requests 3 and 3a merely redefines the claimed invention in terms of the *use* of a combustion engine for the purpose of dosing, otherwise defining the same steps and limitations. Such a use is interpreted as nothing other than a method of dosing comprising those steps and limitations. Such a reformulation per se fails to differentiate the claimed subject-matter from the obvious combinations above. The clarifications and limitation to iron comprising additives added to claim 1 in auxiliary request 3a equally fail to do so.

Both requests do add a feature - at least 80% return - not apparent in any of the cited prior art. The Board has been given no indication as to the technical significance of this feature, nor is this self-evident. At best it represents usual or optimal return rates for a diesel engine, at worst it is arbitrary. In either case this feature does not involve inventive activity on the part of the skilled person.

5.3 The Board thus finds that the subject-matter of claim 1 according to the auxiliary requests 1a, 1b, 1c, 1d, 2, 3 and 3a also does not involve an inventive step, Articles 52(1), 56 EPC.

6. *Conclusion*

In the light of the above the Board holds that, taking into consideration the amendments proposed in accordance with the main and auxiliary requests, the patent does not meet the requirement of Articles 52(1) and 56 EPC.

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

G. Magouliotis M. Ceyte