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**DECISION**  
**of 26 November 2004**

**Case Number:** T 0323/03 - 3.3.6  
**Application Number:** 99951827.7  
**Publication Number:** 1129153  
**IPC:** C10G 55/04  
**Language of the proceedings:** EN

**Title of invention:**

Deep conversions combining the demetallization and the conversion of crudes, residues or heavy oils into light liquids with pure or impure oxigenated compounds

**Applicant:**

Carbon Resources Limited

**Opponent:**

-

**Headword:**

Heavy hydrocarbon conversion/CARBON RESOURCES

**Relevant legal provisions:**

EPC Art. 56, 84, 123(2)

**Keyword:**

"Clarity and support by the description (yes)"  
"Extension beyond the content of the application as originally filed (no)"  
"Inventive step (yes): state of the art not containing any pointer to the selected specific process steps"

**Decisions cited:**

T 0967/97, T 0092/92, T 0495/91, T 0588/93

**Catchword:**

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Case Number: T 0323/03 - 3.3.6

**DECISION**  
of the Technical Board of Appeal 3.3.6  
of 26 November 2004

**Appellant:** Carbon Resources Limited  
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Alberta T2A 7H8 (CA)

**Representative:** Cole, Paul  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 10 October 2002  
refusing European application No. 99951827.7  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

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

## Summary of Facts and Submissions

- I. This appeal lies from the decision of the Examining Division to refuse European patent application No. 99 951 827.7, relating to a process for the conversion of heavy hydrocarbon.
- II. In its decision, the Examining Division, found that the claimed subject-matter complied with the requirements of Article 84 EPC and was also novel over the cited prior art.

As regards inventive step, it found that

- the notional skilled person would not have arrived at the claimed subject-matter on the basis of the teaching of the cited prior art;
- however, there was no evidence that the claimed process solved the underlying technical problem which consisted in the provision of an alternative method for the conversion of heavy hydrocarbons into lighter liquid products by thermal cracking thereby bringing about a reduction of soot, coke and gaseous products;
- the subject-matter of the independent claim relating to a device differed from the known devices of the cited prior art only because of the compulsory presence of extractors;
- the use of extractors would have been taken into consideration by the notional skilled person, if necessary, for separating the resulting products;

- therefore, the claimed subject-matter lacked an inventive step.

III. An appeal was filed against this decision.

The statement of the grounds of appeal contained four sets of claims - which no longer included claims directed to a device - and **Cooley's affidavit**, dated 7 February 2003, containing a discussion of the cited prior art and an experimental report.

The Board informed the Appellant in a communication dated 8 October 2004 *inter alia* that the independent claims of the requests still pending before the Board did not appear to comply with the requirements of Article 84 EPC and in particular that they characterized the operative conditions of the claimed process by the result to be achieved and did not appear to identify clearly all the process steps essential for obtaining the desired result; moreover, some of the dependent claims appeared not to be supported by the application as originally filed and thus contravened the requirements of Article 123(2) EPC.

IV. During the oral proceedings held before the Board on 26 November 2004 the Appellant filed a new request headed "Auxiliary Request IV" consisting of one claim, to be considered as the only request, and handed out an experimental report headed "**CPJ studies with/without injector**".

The sole claim of this request reads as follows:

"1. A process for the conversion of a load consisting of high density high viscosity crudes, atmospheric residues (Rat), residue under vacuum (RsV) or heavy distillates into a liquid (gasoline, gas oil or another fuel), said process comprising:  
preheating the load to a temperature at which no coking occurs;  
spraying the preheated load into an injector;  
preheating steam at a temperature of 600 to 800°C;  
supplying the preheated steam to the injector at a ratio of steam to carbon in the load of at least 0.7 and expanding the preheated steam adiabatically in the injector to form a jet of sprayed load and steam that does not come into contact with any material wall of the injector and the kinetic energy of the steam becoming transferred to the sprayed load to cause the heavy molecules in the load to break, the energy supplied to the load by preheating and the kinetic energy of the jet being barely sufficient to initiate breaking of the molecules of the load into two to form lighter molecules and thereby bring about said conversion, the breakage being endothermic and consuming said kinetic energy;  
supplying the load and the steam from the injector after the load has contacted the preheated steam direct into a reactor that is empty and without catalyst to achieve thermodynamic equilibrium, the reactor being at 440 to 520°C and at 20 to 30 bar;  
expanding the contents of the reactor to a lower pressure;  
supplying the expanded contents of the reactor directly into at least one extractor."

V. The Appellant submitted during oral proceedings *inter alia* that

- the sole claim of the amended request complied with the requirements of Articles 84 and 123(2) EPC;
- the most reasonable starting point for the evaluation of inventive step was a known thermal cracking process carried out in a Coker (as mentioned on page 2, lines 33 to 34 of the description) which brought about the conversion of heavy hydrocarbons into lighter liquid products while "rejecting" coke;
- the technical problem underlying the claimed invention had thus to be seen as the provision of an alternative method for the conversion of heavy hydrocarbons into lighter liquid products by thermal cracking, thereby bringing about the reduction of coke and gaseous products;
- this problem had been solved by means of the claimed method as shown in **Cooley's affidavit** filed with the statement of the grounds of appeal and in the experimental report headed "**CPJ studies with/without injector**" handed out during the oral proceedings before the Board;

- since the state of the art did not suggest to select the specific process steps of the claimed method in order to solve such a technical problem, the claimed subject-matter involved an inventive step.
- VI. The Appellant requests that the decision under appeal be set aside and that a patent be granted on the basis of the sole claim according to the request submitted at the oral proceedings.

### **Reasons for the Decision**

1. The Board is satisfied that the sole claim of the Auxiliary Request IV, which is the only request left pending before the Board, meets the requirements of Article 84 since its wording is clear and defines the claimed invention by means of technical features supported by the description.

The Board is also satisfied that, taking into consideration the teaching of the application as originally filed as a whole, the wording of the claim consists in a combination of features which can be considered to be applicable to the treatment of all the starting materials encompassed by the claim.

Support for these features can be found in particular on page 1, lines 9 to 10 and 15 to 16 in combination with page 4, lines 18 to 19; page 3, lines 14 to 16; page 4, line 25; page 5, lines 17 to 22, 26 to 27 and 32; page 6, lines 5 and 17 to 18; page 12, lines 8 to 10 and 34 to 39; page 16, lines 47 to 48; page 17,

lines 1 to 2; page 18, lines 4 to 6; page 20, lines 5 and 17; page 22, lines 24 to 25 in combination with page 24, lines 4 to 6 and 36; page 28, lines 30 to 32; page 29, lines 2 to 17 and 25; page 31, lines 12 to 16, 25 to 26, 30 to 31 and 34 to 40 in combination with page 32, lines 23 to 24; page 32, lines 4 to 8, 10 to 12 and 14 to 17 in combination with lines 23 to 26; page 46, lines 2 to 5; claims 1, 5, 6, 13, 15 and 23 (all references being based onto the published PCT specification WO 00/23540 corresponding to the present European patent application).

The Board finds thus that this claim complies with the requirements of Article 123(2) EPC.

## 2. *Inventive Step*

2.1 The present application and, in particular, the subject-matter of the sole claim, relates to a process for the conversion of a load consisting of high density high viscosity crudes, atmospheric residues (Rat), residue under vacuum (RsV) or heavy distillates into a liquid (gasoline, gas oil or another fuel) without the use of catalysts, a so-called **CPJ** process (see page 1, lines 9 to 11; page 3, lines 14 to 15; page 4, lines 18 to 19; page 5, line 26).

As explained in the present application, known processes for the conversion of the above mentioned materials by catalytic cracking such as the **FCC** process required the regeneration of spent catalysts and led to the formation of a significant quantity of gas; moreover, known thermal cracking processes (i.e. processes not involving the use of a catalyst) like the



**VISBREAKING**, the **COKING** or the **FLEXOCOKING** processes, led either to insufficient conversion or to significant production of coke (page 1, line 20 to page 3, line 10).

- 2.2 As mentioned in the decision of the first instance none of the cited documents was considered as a suitable starting point for the evaluation of inventive step (see page 4 of the appealed decision).

The Board, in agreement with the Appellant, considers therefore that the most reasonable starting point for the evaluation of inventive step has to be considered a known thermal cracking process currently used at the priority date of the present application for the same type of conversion achieved by the process of the present application. As suggested by the Appellant during oral proceedings the **COKING** process, mentioned on page 2, lines 33 to 34 of the description, is such a process since it leads to the conversion of heavy hydrocarbons into lighter gasoline, gas oil or other fuel liquid products.

The Board thus takes this known process as the most reasonable starting point for the evaluation of inventive step of the claimed subject-matter.

- 2.3 The process of the present application differs from this known process *inter alia* insofar as, before feeding the hydrocarbon load and steam to the empty reactor, steam and the preheated hydrocarbon load are supplied into an injector under such specific operative conditions that the energy supplied to the load by preheating and the kinetic energy of the steam jet is barely sufficient to initiate breaking of the molecules

of the load into two to form lighter molecules and thereby bring about said conversion, the breakage being endothermic and consuming said kinetic energy.

- 2.4 The Appellant has defined the technical problem underlying the present invention during oral proceedings as the provision of an alternative method for the conversion of heavy hydrocarbons into lighter liquid fuel products by thermal cracking which brings about a reduction of coke and gaseous products formed during the process.

The Board agrees with this definition of the technical problem and has no doubts, in the light of the experimental evidence submitted by the Appellant, e.g. Mr Cooley's affidavit and the experimental report headed "**CPJ studies with/without injector**" (see especially the first left column), that the claimed process leads to the production of only an insignificant amount of light gaseous products such as hydrogen and methane and, contrary to the known **COKING** process, to a very minor formation of coke.

The Board is thus satisfied that the claimed process solves the above mentioned technical problem.

- 2.5 It is the established jurisprudence of the Boards of appeal of the EPO that, in order to guarantee an objective evaluation of the inventiveness of a claimed subject-matter, the so-called "problem-solution" approach should be adopted and if, exceptionally, a different one is chosen, a reasoning should be given for departing from this generally approved approach (see Case Law of the Boards of Appeal of the EPO, 4<sup>th</sup>

edition, 2001, I.D.2, pages 101 and 102 as well as T 967/97, unpublished in OJ EPO, points 3 and 3.1 to 3.3 of the reasons for the decision).

- 2.6 As already acknowledged by the Examining Division in its decision the cited prior art did not contain any pointer that would have motivated the notional skilled person to select the specific process steps of the claimed process (see the passage bridging pages 4 and 5).

However, the Examining Division, without identifying the starting point for the evaluation of inventive step, concluded that the claimed process did not appear to solve the technical problem identified in the application and thus lacked an inventive step (see page 2 of the minutes of the oral proceedings held on 23 September 2002 and page 5 of the written decision).

The Board finds thus that in the present case the Examining Division, not applying the "problem-solution" approach, should have at least indicated the reasons for departing from it.

- 2.7 Moreover, according to the established jurisprudence of the Boards of Appeal of the EPO, even though the presence of a technical advantage may serve as a basis for defining a technical problem in an objective manner and therefore may be an indication of the presence of inventiveness, its absence is not sufficient for deciding that a claimed subject-matter lacks inventive step. This situation may rather request the investigation of the technical problem and, subsequently, the determination of the so-called

"objective" technical problem (see e.g. T 495/91, unpublished in OJ EPO, point 4.2 of the reasons for the decision). This could be, for example, the finding of an alternative solution to a technical problem already solved according to the state of the art. An invention in fact may also lie in the provision of an alternative process which brings about comparable results to a known process chosen as the starting point for the evaluation of inventive step (see T 92/92, point 4.5 of the reasons for the decision and point T 588/93, point 6.1 of the reasons for the decision, both unpublished in OJ EPO).

Therefore, the Board finds the motivation of the Examining Division that the claimed method lacked an inventive step erroneous.

- 2.8 On the contrary, since the prior art did not contain any pointer that would have motivated the notional skilled person to modify a known **COKING** process by selecting the specific process steps of the above mentioned sole claim in order to solve the underlying technical problem, the claimed subject-matter is to be considered as involving an inventive step.

**Order**

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

1. The decision under appeal is set aside.
  
2. The case is remitted to the first instance with the order to grant a patent with the claim according to the request submitted at the oral proceedings and the description and figures to be adapted thereto as necessary.

The Registrar:

The Chairman:

G. Rauh

P. Krasa