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**D E C I S I O N**  
**of 28 February 2002**

**Case Number:** T 0455/00 - 3.2.3

**Application Number:** 94103091.8

**Publication Number:** 0617230

**IPC:** F22B 1/18, F22B 35/00

**Language of the proceedings:** EN

**Title of invention:**  
Method of operating a waste heat boiler

**Patentee:**  
HALDOR TOPSOE A/S

**Opponent:**  
ALSTOM Power Energy Recovery GmbH

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
"Inventive step (yes)"

**Decisions cited:**  
-

**Catchword:**  
-



**Case Number:** T 0455/00 - 3.2.3

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.3**  
**of 28 February 2002**

**Appellant:** HALDOR TOPSOE A/S  
(Proprietor of the patent) Nymollevej 55  
DK-2800 Lyngby (DK)

**Representative:** Grünecker, Kinkeldey  
Stockmair & Schwanhäusser  
Anwaltssozietät  
Maximilianstrasse 58  
D-80538 München (DE)

**Respondent:** ALSTOM Power Energy Recovery GmbH  
(Opponent) Ellenbacher Strasse 10  
D-34123 Kassel (DE)

**Representative:** -

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 23 March 2000  
revoking European patent No. 0 617 230 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** C. T. Wilson  
**Members:** J. du Pouget de Nadaillac  
M. K. S. Aúz Castro

## Summary of Facts and Submissions

I. The appeal is directed against the decision dated 23 March 2000 of an opposition division of the European patent office, which revoked the European patent EP-B1-0 617 230.

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

"Method of operating a waste heat boiler comprising within a cylindrical shell a plurality of heat exchanging tubes having an inlet end and an outlet end;

attached to the shell, means for introducing water on shellside of the tubes;

means for introducing a hot process gas stream into the inlet end of the tubes and passing the gas stream through the tubes in indirect heat exchange with the water on the shellside of the tubes to produce steam and to cool the introduced process gas stream;

means for withdrawing produced water/steam, and means for withdrawing the cooled gas stream;

the tubes being arranged in at least two tube bundles each of which is provided with gas flow control means;

which method comprises adjusting flow distribution and flow rate of the hot gas stream between the different tube bundles to control the production of steam and the cooling of the process stream so as to obtain a desired outlet temperature of a gas stream at different fouling and loading conditions."

III. According to the above mentioned decision, the subject-matter of said claim did not imply an inventive step having regard to the prior art document D10 (DE-C-28 46 455) and a public prior use, which was considered to be proven by the following evidence:

- D1: Drawing A11/000-1, dated 25 March 1981, of Schmidt'sche Heißdampf-Gesellschaft mbH ("S.H.G."), concerning a "Rauchrohr-Abhitzekessel mit Dampftrommel D-2 und B-2", the boiler D-2 having the manufacturing No. 6860;
- D2: Copy of a letter dated 19 August 1991 of Th.Goldschmidt AG to S.H.G. attesting the good state after ten years working of the boiler built in 1981 with the manufacturing No. 6860;
- D7: Copy of a letter dated 24 April 1981 of Hugo Peterson (Ges. für verfahrenstechnische Anlagen mbH & Co KG) to S.H.G. concerning the order No. 9228 00/01 of a waste boiler to be installed on the site of Th.Goldschmidt AG, Mannheim.
- D8: Copy of the delivery bill dated 5 April 1982 of S.H.G., certifying the delivery to Hugo Peterson of a boiler, manufacturing No. 6860 according to the order No. 922800/01.

IV. The appellant, proprietor of the patent, filed the appeal and paid the corresponding fee on 5 May 2000. The statement of grounds of appeal was received on 1 August 2000.

V. In response to the communication of the board of appeal attached to the summons to oral proceedings, the respondent/opponent submitted on 25 January 2002 the following new evidence concerning the above mentioned prior use:

- D14: Drawing A11/180-2 dated 10 June 1981 of S.H.G., concerning the gas outlet chamber of the boiler D-2 with the control valves;
- D15: Copy of a letter dated 15 May 1981 of Hugo Peterson to S.H.G. and attached thereto a specification brochure for the boiler installation, subject of their order No. 922800.
- D16: Statutory declaration dated 24 January 2002 of Mr Heberling, who was the managing director of S.H.G. in the 80's.

V. Oral proceedings took place on 28 February 2002. Half an hour before the beginning of these proceedings, the board was advised by a fax received just the day before at 17,44h by the European Patent Office that the respondent would not attend the oral proceedings and that its opposition was withdrawn. By a further fax received the day of these proceedings, the former respondent confirmed said fax.

VI. The arguments presented by the appellant during the oral proceedings can be summarized as follows:

Until the present invention it was known to improve the heat transfer of a waste heat boiler and to control its outlet temperature by means of at least one by-pass tube

through which part of the hot process stream flowed during initial operation of the boiler, the heat exchanging tubes, which were not yet fouled and corroded, providing a good heat transfer. A drawback of these boilers equipped with by-pass tubes is that the by-pass tube itself and its control valve can be quickly corroded, since they are in contact with very hot gases. D15 confirms this problem by specifying that the valve of the by-pass tubes according to D1, which discloses such a boiler, must be protected against high temperatures. Although the by-pass tubes in this prior art are not insulated as is usually the case and therefore can partly transfer heat, a person skilled in the art reading this document would clearly have distinguished these by-pass tubes from the heat exchanging tubes which are surrounding them, since he knew that the heat exchange process, which could be obtained from by-pass tubes, is negligible vis-a-vis that due to the heat exchanging tubes, and thus is not taken into consideration.

The present invention avoids the above mentioned drawback, while still obtaining a desired heat transfer and temperature control at changing fouling and loading conditions of the boiler. The solution as claimed cannot be suggested by D10, which merely discloses a single insulated and centrally disposed by-pass tube provided with its own valve, that is to say a by-pass tube showing the same drawback as D1.

- V. The appellant requested the decision under appeal to be set aside and the patent to be maintained as granted.

### **Reasons for the Decision**

1. The appeal is admissible.
2. The only issue to be decided is whether the subject-matter of claim 1 as granted involves an inventive step or not.

The appellant has not contested that the prior use according to the submitted evidence D1, D2, D7, D8 and D14 to D16 belongs to the state of the art according to Article 54 (2) EPC. The waste heat boiler disclosed by this public prior use represents the prior art closest to the present invention, since it is a boiler of the shell-and-tube type and more specifically comprises two groups or bundles of tubes, which are concentrically disposed relative to each other, inside a cylindrical shell, each bundle being provided with its own flow control valve. In operation, water surrounds the tubes of both bundles, whereas the hot process gas stream flows through the tubes. According to the drawing D1, the first bundle of tubes, which is centrally disposed, is said to comprise 22 **by-pass** tubes, each having a diameter of 88.9 mm, and the second ring-shaped bundle, surrounding the first one, 298 "gas tubes", which means heat exchanging tubes, each of said tubes having a diameter of 44.5 mm. All tubes are made of the same steel material, but the by-pass tubes, which in this prior art are not insulated as is usually the case with by-pass tubes, have a greater thickness (4 mm) than the heat exchanging tubes (2,9 mm), showing together with the implied number of tubes that the main function assigned to these tubes is not to participate in the heat exchange process, but only to by-pass a part of the hot stream. Evidence D15, which sets out the constructional requirements of the buyer of the boiler, confirms on page 10a that the boiler had to have an

internal **bypass system**, which allowed a control of the outlet temperature at different loading conditions. According to evidence D14 and D16, the two valves of both tube bundles were linked to each other, so as to fulfill this function. Evidence 15, further, indicates that the valve of the by-pass system must be protected against high temperatures, confirming thus the function of the tubes, since the part of the hot process stream which is by-passed has a higher temperature than that of the stream flowing through the heat exchanging tubes, and showing moreover that the corrosion problem of the valve of the by-pass system was known.

3. The boiler according to claim 1 of the patent in suit differs from the above disclosed boiler in that both bundles are made of heat exchanging tubes. It means that the above temperature control function is no more performed by the cooperation of a bundle of heat exchanging tubes with a bundle of by-pass tubes but by the cooperation of two bundles of heat exchanging tubes, that is to say tubes which are effective in the heat exchanging process. According to the dependent claims, the tube bundles can be provided with a different number of tubes having moreover different diameters in the different bundles.

The use of two bundles of heat exchanging tubes permits to control the heat transfer and thus, the temperature in both the process gas and steam streams, in particular the outlet gas temperature, at changing fouling conditions by adjusting the flow of the process gas stream in the different tube bundles, as was the case in the prior art with the by-pass tube bundle and heat exchanging tube bundle. With the present invention, since only heat exchange tubes are involved,



that is to say tubes with good heat transfer, it is possible to keep the outlet gas temperature at a low level, thus avoiding the risk of corrosion in both tube bundles. Therefore, the problem solved by the present invention can be regarded as providing a method of operating waste heat boilers of the known shell-and-tube exchanger type to obtain a desired heat transfer and temperature control at changing fouling and loading conditions without having the drawback of the boilers of this type, which were previously provided with by-pass tube(s).

4. No prior art document, among those cited during the opposition and appeal proceedings, discloses or suggests this solution. D10 was more particularly mentioned, since it discloses a single valve system which acts in opposite direction on both the outlet common for all heat exchanging tubes and the outlet of a single central by-pass tube, which is insulated. This document, therefore, suggests to link the valves of two different kinds of tubes of a boiler in order to control the outlet temperature of the heating gas stream. However, as seen above, this idea could already be found in the prior use according to D1, so that D10 in this respect does not bring anything new. Moreover, a person skilled in the art, looking for a solution to the above formulated problem, would not have considered this prior art D10, since it does not solve the corrosion problem of the by-pass valve. As far as the solution itself is concerned, this prior art still employs a by-pass tube as such and, thus, provides no hint towards the claimed solution, namely the use of a further group of heat exchanging tubes.

5. Consequently, the board concludes that it would not

have been obvious to replace the by-pass tubes known from the public prior use according to D1 by a further heat exchanging tube bundle. The subject-matter of claim 1 as granted, therefore, involves an inventive step (Articles 52 and 56 EPC).

6. As follows from the above, the clue of the present solution essentially lies in the different functions of the tubes used in a heat boiler, namely tubes which are used for the heat exchange process and tubes which are used to by-pass a portion of the hot gas stream from the heat exchanging process. For a person skilled in the art in this technical field, the function assigned to the tubes determinates the kind of tubes, their structural specifications. As the appellant has indicated, one does not consider the heat transfer eventually provided by by-pass tubes, since it is negligible compared to that obtained by means of the heat exchanging tubes. For these reasons, the decision under appeal is to be set aside.

## **Order**

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

1. The decision under appeal is set aside.
2. The patent is maintained unamended.

The Registrar:

The Chairman:

A.Counillon

C.T.Wilson