(54) Title: PROCESS FOR OPERATING A PLANT FOR PRODUCING CALCINED CLAY

(57) Abstract: The production of calcined clay is effected by using a plant known per se for producing cement by the dry or semiwet process, with a precalciner (1), for instance comprising at least one preheating line of series-connected preheating stages (2), such as cyclone preheaters or grate preheaters, and a rotary kiln or roaster (3). In accordance with the invention, the rotary kiln or roaster (3) for generating heating gas is utilized as combustion chamber (31), replaced by a combustion chamber (33') and/or completed by an additional combustion chamber.

FIG. 1

solids offgas

stage 1

stage 2

stage 3

stage 4

650 to 850°C

fuel + air

product
Process for Operating a Plant for Producing Calcined Clay

This invention relates to a process for operating a plant for producing calcined clay.

At present, cement primarily is made of ground cement clinker, which is, however, very energy-intensive and leads to high CO₂ emissions. Beside the CO₂ emission from the combustion for achieving the clinker temperature as high as about 1450°C, CO₂ is separated and emitted from limestone - the main raw material of clinker production. One possibility for reducing CO₂ emissions is the admixture of cement substitutes, such as calcined clay.

Conventional plants for cement production by the dry or semidry process consist of a precalciner (for instance series-connected cyclone preheaters) and a succeeding rotary kiln, alternatively a grate preheater (Lepol process) in the semiwet process.

Calcining fine-grained mineral solids, such as clay, conventionally is effected in rotary kilns or multiple-hearth furnaces. This ensures the maintenance of a low temperature with a retention time necessary for treatment in this process. U.S. patent 4,948,362 for instance describes a process for calcining clay, in which kaolin clay is treated in a multiple-hearth furnace by means of a hot calcining gas to increase gloss and minimize abrasiveness. In an electrostatic precipitator, the calcined clay powder is separated from the waste gas of the calcining furnace and processed to obtain the desired product.

Due to the described demand of calcined clay for cement production, an inexpensive production process herefor is of particular interest. It is the object of the present invention to satisfy this demand close to the place of cement production.

This object in particular is solved with the invention in that for manufacturing calcined clay, the plant for producing cement by the dry or semiwet process is used itself, with a precalciner, for instance comprising at least one line of series-connected preheating
stages, such as cyclone preheaters or grate preheaters, and a rotary kiln or roaster, wherein in accordance with the invention the rotary kiln or roaster for producing heating gas is utilized as combustion chamber, replaced by a combustion chamber and/or completed by an additional combustion chamber. The heating gases are used for calcining clay and are guided through the preheating stages in counterflow to the solids. In accordance with the invention, an existing cement plant thus can be converted to operation for calcining clay at low cost by using the existing precalcining stages.

The clay preferably is heated by the respective combustion chamber heating waste gases to a temperature of up to 900°C, preferably between 650 and 850°C; with a corresponding retention time, these temperatures are sufficient to completely calcine the clay.

In accordance with the invention, it may be advantageous when preheating is effected in at least two preheating lines, wherein the one preheating line serves for preheating the clay and the other one for heating clinker raw material.

A particularly flexible operation is possible when beside the rotary kiln or roaster for cement production an additional combustion chamber is operated, to which a separate heating line for the clay possibly is associated.

In a further aspect of the invention, a fuel/air mixture can be supplied to the heating gas stream of the respective combustion chamber before entry into the preheating line, so that enough heat is available in the possibly two or more preheating lines.

For the purpose of a flexible and economic utilization of the process of the invention, the fuel and/or air supply for the respective combustion chamber can be controllable. In the rotary kiln or roaster, relatively poor fuels, such as coal, carbonaceous minerals with sufficiently positive calorific value, biomass, sewage sludge and/or wastes can be used, which further increases the economy of the process.

With a suitable mineralogical composition, the combustion residues can be admixed to the mass flow "calcined clay".
Further objectives, features, advantages and possible applications of the invention can be taken from the following description of embodiments and the drawing. All features described and/or illustrated form the subject-matter of the invention per se or in any combination, also independent of their inclusion in individual claims or their back-reference.

The only Figure illustrates an example for performing the process of the invention.

The illustration in the only Figure represents the fundamental principle of the operation of a plant for producing cement. The same includes a precalciner 1 with a plurality of preheating stages 2, which for instance can be formed as cyclone preheaters. Furthermore, it includes a rotary kiln 3, which in accordance with the invention can, however, (also) be operated as combustion chamber 3' by supplying fuel and air. To the heating gas obtained in the combustion chamber 3', a fuel/air mixture can be supplied before entry into the precalciner 1. As a result, heating of the clay to be calcined, which is added as solid in counterflow to the heating gases, can be effected up to 900°C, preferably to 650 to 850°C.

Variants of the process shown in the drawing in particular consist in that either to the one rotary kiln 3 with one preheating line a combustion chamber 3' additionally is associated or that to the one rotary kiln 3 operated as combustion chamber 3' at least two preheating lines from preheating stages 2 are associated, wherein for instance in the one preheating line clinker raw materials are preheated and in the other preheating line the clay to be calcined is preheated. To make this process more flexible, combinations of these variants can also be used.
List of Reference Numerals

1  precalciner
2  preheating stages
5  3  rotary kiln or roaster
3'  combustion chamber
Claims

1. A process for operating a plant for producing calcined clay by using a plant known per se for producing cement by the dry or semiwet process, with a precalciner (1), for instance comprising at least one preheating line of series-connected preheating stages (2), such as cyclone preheaters or grate preheaters, and a rotary kiln or roaster (3), wherein the rotary kiln or roaster (3) for producing heating gas is utilized as combustion chamber (3'), replaced by a combustion chamber (3') and/or completed by an additional combustion chamber (3'').

2. The process according to claim 1, characterized in that the clay to be calcined is guided through the precalciner (1) in counterflow to the heating gases of the respective combustion chamber (3') and is heated by the heating gases to a temperature of up to 900°C, preferably between 650 and 850°C.

3. The process according to claim 1 or 2, characterized in that preheating is effected in at least two preheating lines, wherein the one preheating line serves for preheating the clay and the other one serves for heating clinker raw material.

4. The process according to any of the preceding claims, characterized in that beside the rotary kiln or roaster (3) for cement production an additional combustion chamber (3'') is operated, to which possibly a separate preheating line for the clay is associated.

5. The process according to any of the preceding claims, characterized in that a fuel/air mixture is supplied to the heating gas stream of the respective combustion chamber (3') before entry into the respective preheating line.

6. The process according to any of the preceding claims, characterized in that the fuel and/or air supply for the respective combustion chamber (3') is controllable.
7. The process according to any of the preceding claims, **characterized in** that in the respective combustion chamber (3') coal, carbonaceous minerals with sufficiently positive calorific value, biomass, sewage sludge and/or wastes are burnt.

8. The process according to any of the preceding claims, **characterized in** that the combustion residues obtained in the respective combustion chamber/rotary kiln are added to the mass flow "calcined clay".

9. A plant for performing a process according to any of the preceding claims, comprising a precalciner (1) and a rotary kiln and/or roaster (3) operable as combustion chamber (3') and/or a combustion chamber (3') for generating heating gas.
## INTERNATIONAL SEARCH REPORT

### A. CLASSIFICATION OF SUBJECT MATTER

**INV.** C04B33/32

According to International Patent Classification (IPC), or to both national classification and IPC.

### B. FIELDS SEARCHED

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched.

- **C04B**

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

**EPO-Internal**, **WPI Data**

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Citation of document with indication, where appropriate of the relevant passages</th>
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**A** document defining the general state of the art which is not considered to be of particular relevance

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### D. Further documents are listed in the continuation of Box C

- **X** See patent family annex

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- **X** document of particular relevance the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

- **Y** document of particular relevance the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

- **S** document member of the same patent family

### Date of the actual completion of the international search

17 September 2009

### Date of mailing of the international search report

21/10/2009

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