

Improved cement clinker production with integrated calcium looping process

Background

To produce cement clinker, raw meal (kiln meal) is calcined in a production process and subsequently converted into cement clinker at high temperatures in a kiln (rotary kiln). Cement clinker serves as a basic material for the production of cement. Global production of cement in 2020 amounted to an estimated 4 billion tons. The cement clinker process is very energy-intensive and releases large amounts of CO₂. Impurities, in particular sulfur (SO₂), chlorine (HCl) and other halogens, such as F, Br and I, and the alkalis potassium and sodium cannot leave this cement clinker production process, or only to a limited extent, and therefore accumulate. This can lead to problems in plant operation.

Problem

The CO₂ emissions in the cement clinker production process are too high. One promising method for CO₂ capture in particular is the calcium looping process. For the application of this calcium looping process, which is integrated into the cement clinker production process, it is of great importance that the calcined raw meal contains as much reactive CaO as possible. The reactive CaO should then react as exclusively as possible with CO₂ and as little as possible with other gas components such as Cl and SO₂. A negative influence of alkalis on the CaO-rich sorbent (e.g. reduction of the reactive surface by condensation of alkalis) should also be minimized.

Solution

An efficient and cost-effective process for the control of sulfur and also chlorine and alkali cycles in cement clinker production plants using the integrated calcium looping process for CO₂ capture has now been designed at University of Stuttgart, Germany and protected by EP 3 594 597 B1 patent. In this process, the most extensive possible contact is established between the undesirable compounds contained in the flue gas and the calcined raw meal, so that these compounds can pass into the calcined raw meal. In this way, it should be possible to remove approx. 50-90% of the undesirable compounds from the cement production process. By reducing the S, Cl and alkali components, there is also less corrosion or fouling. Furthermore, compounds of other elements that can potentially accumulate in the calcium looping system, such as compounds of lead, zinc, cadmium, thallium can be removed from this looping system in whole or in part. In addition, there are also energetic advantages.

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Service

Technologie-Lizenz-Büro GmbH
has been entrusted with the
exploitation of this technology and
assists companies in obtaining
licenses.

Advantages

- Removal of 50-90% of undesirable compounds from the production process
- Less corrosion
- Less fouling
- Energy saving

Fields of application

Production of cement clinker in combination with the calcium looping process