polysius® pure oxyfuel – Best-in-class technology for carbon capture in cement production

The production of cement releases large quantities of carbon dioxide (CO_2). Only a third of these CO_2 emissions result from the combustion of fossil fuels such as coal or petroleum coke, while the biggest share is released by the calcination of limestone. Depending on quality, limestone – the main component of cement – consists of 35% to 44% CO_2.

Dr. Luc Rudowski, Head of Innovation at thyssenkrupp Industrial Solutions, Business Unit Cement Technologies: "Reducing CO_2 emissions in cement production is one of the most important challenges facing the industry today. As part of our #grey2green journey we are developing technologies and solutions for sustainable cement production without losing sight of plant profitability and productivity. One example of this is the newly developed polysius® pure oxyfuel technology for optimum CO_2 separation. Other solutions developed by us range from more sustainable cement production using polysius® activated clay or polysius® booster mill, the optimal use of alternative fuels with prepol® SC, to reducing NOx emissions through Cemcat® SCR."

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Oxyfuel – pure oxygen replaces air in the kiln

The Oxyfuel technology replaces ambient air in the clinker production process with pure oxygen introduced into the front zone of the cooler. As the nitrogen content of the air is no longer present, the CO_2 concentration in the kiln exhaust gas can be increased to up to 100%. This much more efficient CO_2 separation serves as the basis for the downstream utilization or storage of carbon dioxide.

However, the advantage of reducing the exhaust gas to a virtually pure CO_2 stream means that there is too little gas in the preheater to operate the cyclones. In the first-generation Oxyfuel process, this necessitated a complex gas recirculation system from the preheater exhaust to the cooler involving heat exchange, dust removal, and condensation.

> "By using the polysius® pure oxyfuel process, our customers profit from optimized operating costs, while freeing our communities and environment from high CO_2 emissions."

Eike Willms, Senior Engineer, BU Cement Technologies

Research company CI4C investigating use of polysius® pure oxyfuel

The four European cement manufacturers Buzzi Unicem-Dyckerhoff, HeidelbergCement AG, SCHWENK Zement KG, and Vicat plan to investigate the industrial-scale use of Oxyfuel carbon capture technology in cement production in a demonstration plant. To this end, the research company “CI4C - Cement Innovation for Climate” was established. The aim is to capture 100% of the CO_2 and use it with the help of renewable energies to produce so-called “refuels”, i.e. climate-neutral synthetic fuels such as kerosene for the aviation industry.

> “By using this technology, the cement industry could significantly reduce its process-related CO_2 emissions and thus make an important contribution to climate protection.”
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> Dr. Markus Sauer, Senior Proposal Manager

Dr. Markus Sauer, Senior Proposal Manager: “The research company CI4C and thyssenkrupp are currently investigating the use of our polysius® pure oxyfuel technology in a demonstration plant. Working with our long-standing customers, we would be delighted if we could demonstrate the efficiency of our technology for the first time on an industrial scale. By using this technology, the cement industry could significantly reduce its process-related CO_2 emissions and thus make an important contribution to climate protection.”

The bottom line: The polysius® pure oxyfuel technology is the Best-in-class technology for carbon capture in cement production. It captures up to 100% of CO_2 emissions and is a further important step in #grey2green initiative. For cement producers, this means lower investment and operating costs due to elimination of exhaust gas recirculation. Next step: The world's first industrial application. Cement producers investigating use in a planned demonstration unit.

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