



“A Milestone Along the Way to CO₂-Free Power Plants”

An innovative method inexpensively and energetically efficiently reduces power-plant CO₂-emissions by more than 90 %. The initial system for utilization on an existing power plant is currently in the planning stage

Darmstadt, November 27, 2012. A new method for capturing carbon dioxide (CO₂) emitted by power plants could reduce their CO₂-emissions by more than 90 %, while utilizing less energy and incurring less expense than former approaches. The TU Darmstadt, which operates one of the world’s largest pilot systems for capturing CO₂, has been investigating the “carbonate-looping” method for the past four years, with success. Yet another major benefit of the method is that it may be retrofitted to existing power plants.

Large quantities of the greenhouse gas CO₂ are generated during the combustion of fossil fuels, such as coal and natural gas. A key technology for arriving at lower-emission, more environmentally friendly, power plants is thus carbon capture and utilization (CCU) applied to fossil fired power-plants. CCU could allow reducing CO₂-emissions arising from employing fossil fuels for generating electricity and various other purposes by industry to a minimum and thereby significantly contribute to reducing greenhouse-gas emissions. However, previous approaches to CO₂-capture required high energy inputs and operating costs, which reduced their efficiency and hindered their acceptance.

Limestone binds the CO₂ contained in power-plant flue gases

The TU Darmstadt’s Institute for Energy Systems and Technology has been conducting pilot-scale investigations of various innovative methods for CO₂-capture. Means are being developed for virtually totally avoiding CO₂-emissions, while keeping energy inputs and operating costs extremely low. In conjunction with that work, the “carbonate-looping” method has emerged as a particularly promising approach that the Darmstadt researchers have meanwhile studied for more than 1,000 operational hours. The carbonate-looping method involves initially employing naturally occurring limestone for binding CO₂ contained in power-plant flue gases in a first-stage reactor. The, now pure, CO₂ is then reliberated in a second-stage reactor and may subsequently be further processed or stored. The TU Darmstadt’s pilot-scale research system proved capable of capturing more than 90 % of the CO₂ emitted, while reducing both the energy input and operating costs formerly required for CO₂-capture by more than 50 %. Yet another benefit of the “carbonate-looping” method is that it may be retrofitted to existing power plants. Institute Director Prof. Dr.-Ing. Bernd

Corporate Communications

Karolinenplatz 5
D-64289 Darmstadt
Germany

Your contact:
Christian Siemens
Tel.: +49-(0)6151-163229
FAX: +49-(0)6151-164128
siemens.ch@pvw.tu-darmstadt.de

www.tu-darmstadt.de/presse
presse@tu-darmstadt.de



Epple, who, along with his staff of more than thirty coworkers, have been investigating the method, remarked that, “This method represents a milestone along the way to CO₂-free power plants and will allow coal-fired, natural-gas-fired, waste-derived-fuel-fired, and biomass-fired, power plants to reliably, cost-effectively, generate electricity and heat, without burdening the environment.”

Suitability for utilization on full-scale systems

Since various investigations and simulations conducted in parallel have indicated that the method would be suitable for utilization on full-scale systems, the experience gained by the TU Darmstadt group is currently being applied to a system that has been scaled up by a factor of twenty. The aim of that project, which is being supported by the German Federal Economics Ministry and various industrial associates, is planning such a scaled-up system for installation on an existing, German, power plant. However, which power plant will be involved remains to be decided.

The investigations of the “carbonate-looping” method have been supported to date by grants totaling more than five million Euros from the German Federal Economics Ministry and various industrial associates. Another project that is supported by grants totaling 1.5 million Euros from the European Union and industry is aimed at further improving the method’s energetic efficiency.

Press contact:

Prof. Dr.-Ing. Bernd Epple

Tel.: +49-(0)6151-162191

e-mail: bernd.epple@est.tu-darmstadt.de

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