Press Release
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Solar Tower Technology Used for the First Time to Provide Process Heat

Along with nitrogen and potassium, phosphates are the main component of fertilisers and, therefore, essential for the food supply of the world's population. However, the mining and processing of phosphates are posing numerous challenges. Morocco is one of the largest phosphate producers and, thereby, fertiliser producers worldwide. The state-owned company OCP (Office Chérifien des Phosphates) in Morocco is the world market leader. Among the challenges of phosphate mining is the energy-intensive process. Up until now, this energy has been provided by burning fossil fuels. OCP, however, as part of its sustainability and decarbonization strategy has set a commitment to reach carbon neutrality by 2040 , hence the goal of switching to green energy alternatives for the drying process by 2030. The Solar Institute Jülich of FH Aachen (SIJ), in cooperation with OCP and other partners from industry and science in Morocco and Germany, is now developing a process for using solar energy instead of fossil fuels in the phosphate mining process. "With this project, we can benefit in two ways at once. On the one hand, we are making a contribution towards decarbonising phosphate production, and on the other hand, we can expand our relationship with a partner country that is of importance for the energy transition," emphasises the director of the SIJ, Prof. Dr. Ulf Herrmann.

Within the framework of the project "SoPhosM - System for the Demand-Oriented Supply of Solar Process Heat for the Drying Process of Phosphate in Morocco", a plant will be built that will dry 100,000 tons of phosphate per year. This will save 1,000 tons of fuel oil. In less than three years, the plant in Morocco is expected to be up and running. The project is funded with €1.6 million by the German Federal Ministry of Education and Research (BMBF), with around €910,000 going to SIJ, which is also coordinating the project. Alongside OCP and other Moroccan research partners such as the Mohammed VI Polytechnic University (UM6P), the Green Energy Park (GEP), the Institute Research Energy Solar And Energy Nouvelles (IRESEN) and the Cadi Ayyad University (UCA), there are, from the German side, the Wuppertal Institute (WI), the German Aerospace Centre (DLR) as well as the technology developers and manufacturers Kraftanlagen Energies & Services (KA), Schlaich Bergermann Partner (sbp) and Hilger GmbH on board.

Inside Morocco, phosphate-containing rock is mined in large open-cast mines. The rock is ground, with water mixed in, to separate the phosphate from the other components, mainly sand. The purified phosphate must then be dewatered so that it can be put to further use. The vision of this project is to develop a new drying plant which will be powered by solar energy to get clean process heat. That will enable a sustainable manner for the drying of phosphate.

The project is based on technologies that have been developed by SIJ, KA and DLR since 2005 and were first implemented in the Solar Tower Jülich. Sun-

FH Aachen
Stabsstelle für Presse-, Öffentlichkeitsarbeit und Marketing
Bayernallee 11
52066 Aachen

Prof. Dr. Roger Uhle,
Pressesprecher
Arnd Gottschalk M.A.
T +49. 241. 6009 51083
gottschalk@fh-aachen.de
team-pressestelle@fh-aachen.de
www.fh-aachen.de

fhac.de/YouTube
fhac.de/facebook
Instagram: fh.aachen

tracing mirrors - the so-called heliostats - direct the sunlight onto a receiver made of porous ceramic material, which is heated by the solar energy. Air flows through the receiver, where the heat is then transferred to the air. At the same time, heat storage and electric heater technology have been further developed in the MultiTESS testing facility and can provide hot air both independently and in combination with the receiver technology. "This way, we can, in principle, heat air to almost 1,000 degrees," explains project coordinator Christian Schwager. This hot air is to be used to dry the washed phosphate at the planned plant in Morocco.

At present, the rotary drum dryers at the OCP production sites are operated with heavy oil and natural gas. For solar technology to expand rapidly, it is important that it can provide heat more cost-effectively than using fossil burners. Through a hybridisation concept, part of the required high-temperature heat is generated with a solar tower while another part is generated with an electric heater and a photovoltaic system. This way, the oil burner, which operates at around 900 degrees Celsius, can be replaced very cost-effectively. Furthermore, the researchers are assessing whether the use of a more efficient dryer can additionally reduce energy expenditure. As part of the SoPhosM project, the Wuppertal Institute is, moreover, analysing the fundamental potential of industrial applications of solar process heat in Morocco as well as the opportunities and challenges for its use.

Morocco is the country with the largest phosphate reserves in the world. 70 percent of the currently known reserves are located in this country. The state-run phosphate company OCP handles mining, processing, transportation and sales, making it a heavyweight in the global phosphate industry. It employs about 20,000 people. Accordingly, it is important to the project partners in Morocco and Germany to make phosphate production as environmentally compatible and health-friendly as possible, while at the same time ensuring a high level of supply security.

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Arnd Gottschalk M.A.
T +49. 241. 6009 51083
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