360 degrees to track the Sun

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Rotating test bench for parabolic troughs enters service at the PSA in southern Spain

The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) and the Spanish Centro de Investigaciones Energéticas Medioambientales y Tecnológicas (CIEMAT) have brought an innovative, rotary test bench for parabolic troughs into operation at the Plataforma Solar de Almería (PSA) in southern Spain. Using this test bench, researchers will be able to test parabolic trough collectors up to 20 metres long at any angle to the Sun and measure their efficiency.

The new test stand, named KONTAS (Konzentrator-Teststand Almeria Spanien) can be used to evaluate complete modules of parabolic trough collectors, as well as individual components such as the mirrors and absorber pipes. Here, researchers can test, among other things, the efficiency with which the mirrors focus the sunlight onto the absorber pipes. During this testing, researchers are able to analyse how well the absorber pipes can convert solar radiation into heat; they are also able to measure heat losses. The DLR Institute of Solar Research and CIEMAT carry out these tests on behalf of manufacturers from the solar-thermal power industry. "With our evaluations, manufacturers can improve their products and develop parabolic troughs for more efficient and cost-effective solar power stations. Young companies as well as many market leaders benefit from our findings," says Peter Heller from the DLR Institute of Solar Research.

Rotating on steel rails

The KONTAS test bench is unique in terms of its mobility. Parabolic reflectors in solar power stations can usually only rotate about their longitudinal axis to track the elevation of the Sun. On this test bench, the collectors are mounted on a six-wheeled rotating platform that moves on circular steel rails; the parabolic mirror can be rotated almost 360 degrees about its vertical axis. "A parabolic trough collector in a solar power station has an orientation to the Sun that depends on the latitude of its location. The closer it is to the equator, the steeper the angle of incidence of the Sun's rays onto the trough. With this rotating test bench, we can adjust elevation and azimuth angles independently and thus simulate any arbitrary orientation of the collector with respect to the Sun," Heller explains while describing the test bench's potential.

Simulating the conditions in a solar power station

Incoming solar radiation, which is collected by the mirror, heats up thermal oil inside the absorber pipe to 400 degrees Celsius. In a solar-thermal power station, this heat is used to produce steam, which is then used to generate electricity using a turbine. On the test bench, the thermal oil is cooled in a cooling unit by a controlled process, allowing energy researchers to replicate the use of the parabolic reflector in a power station and quickly determine the plant's efficiency.

Increased efficiency for solar power stations

The KONTAS test bench is part of the Test and Qualification Centre for Concentrating Solar Power Technologies (QUARZ), which has its headquarters in Cologne. Since 2009, manufacturers and customers of solar-thermal systems have been coming here to test reflectors and absorber pipes for solar power stations. The researchers have developed their own testbeds and methods to conduct these quality tests. They have succeeded in developing internationally recognised quality standards for key components. QUARZ is part of the DLR Institute of Solar Research.

Contacts

Dorothee Bürkle
German Aerospace Center (DLR)
Media Relations, Energy and Transport Research
Tel.: +49 2203 601-3492
Fax: +49 2203 601-3249
Dorothee.Buerkle@dlr.de

Dr.-Ing. Peter Heller
German Aerospace Center (DLR)
Solar Research
Tel.: +34 95 0362-817
Fax: +34 95 0365-313
Peter.Heller@dlr.de

KONTAS rotating test bench

With KONTAS (Konzentrator-Teststand Almeria Spanien), energy researchers from the DLR Institute for Solar Research will be able to test parabolic trough collectors up to 20 metres long at any angle to the Sun and measure their efficiency. The new test stand can be used to evaluate complete modules of parabolic trough collectors as well as individual components such as mirrors and absorber pipes. DLR operates the new test stand at the Plataforma Solar de Almería with CIEMAT.

Rotating through almost 360 degrees

With KONTAS, researchers have expanded the techniques and possibilities for testing solar-thermal power plant components even further.

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Quality tests on parabolic trough collectors

A researcher from the DLR Institute for Solar Research tests a mirror for a solar-thermal power plant. DLR has developed its own test facilities and methods for verifying quality. In important areas, they have succeeded in developing internationally recognised quality standards.

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