

The National Renewable Energy Centre of Spain -CENER- is a technology centre specialized in applied research and development as well as the promotion of renewable energies. CENER is divided into six departments: Wind Energy, Photovoltaic Solar Energy, Solar Thermal Energy, Biomass Energy, Bioclimatic Architecture and Renewable Energy Grid Integration.

More info: www.cener.com



OPTICAL AND THERMAL CHARACTERIZATION OF SOLAR RECEIVERS FOR PARABOLIC - TROUGH COLLECTORS



In solar thermal power plants with parabolic-trough collector technology (PTC), the receiver tube must be able to satisfy the demanding requirements of durability and performance during its useful lifetime, so characterization, certification and quality control of these receiver tubes are of vital importance to be able to ensure the economic feasibility of PTC plants.

The CENER Solar Thermal Energy Laboratory (LEST), which has wide experience in characterization and certification testing of solar thermal collectors and systems, has many different test capacities, including test benches for thermal and optical PTC receiver tube characterization.

Thermal characterization test bench for parabolic trough solar collector receivers

Among the capacities of the LEST's new PTC receiver tube thermal characterization test bench the following should be emphasized:

- Determination of the PTC receiver tube's characteristic thermal loss curve by unit of length. This curve is found by steady-state measurement of the electrical power supplied by assemblies that heat the absorber tube to plant operating temperatures. The absorber tube thermal emittance at different temperatures is determined from the PTC tube thermal loss data.
- Accelerating aging tests of absorber tubes subjected to high temperatures.
- Study of temperature uniformity in PTC receiver tubes using an infrared camera.



Optical characterization test bench for parabolic trough solar collector receivers (PTC)

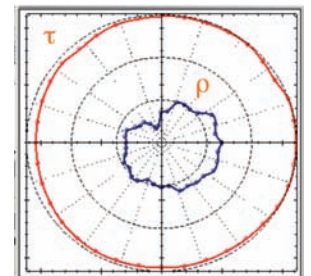
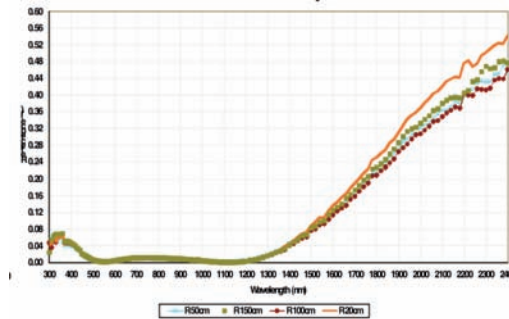
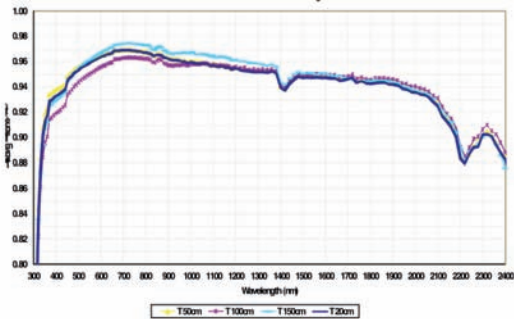


Optical and thermal characterization test benches

The optical characterization test bench is the only one of its kind that can determine the optical properties of a PTC receiver tube during nondestructive testing. This test bench can make spectral measurements of solar transmittance of glass and solar reflectance of the absorber in the 300 nm to 2500 nm wavelength range at different absorber tube temperatures.

The optical test bench is comprised of a simultaneous transmittance and reflectance measurement head which not only moves along the PTC receiver tube, but also has a tube rotation system for measuring at different points in the tube section to test the uniformity of optical properties.

One of the most outstanding and innovative characteristics of this test bench is its ability to make optical characterization measurements at different absorber tube temperatures, thereby allowing the influence of this factor on the PTC receiver tube optical properties to be analyzed.



Transmittance and reflectance measurements at different PTC receiver tube lengths

Angular measurements considering the eccentricity between absorber and glass envelope tubes