Advanced Manufacture of Reflectors

The University of Arizona

Award Number: DE-EE0005796 | November 10, 2012 | Angel

PROJECT OBJECTIVES

Goals:

- Develop and prove new methods for rapidly shaping glass mirrors and coating them for high reflectivity and soil resistance.
- Shaping method to allow for point-focus as well as line-focus.
- Performance objectives:
  - Reflector surface accuracy of 1mR RMS.
  - Reflectivity of 95%.
  - 40% cost reduction for sustained high volume production.

Innovation:

- Novel molding method advances state of art in surface accuracy.
- Advanced fast thermal cycle.

Milestones:

- Establish partnership with a CSP facility in 1st quarter.

APPROACH

Overall approach for 2-year program:

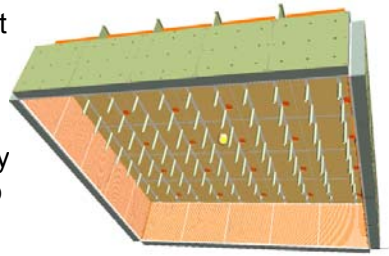
- Slump full sized panels, coated with anti-soil and dielectric coatings and measure reflectance prior to deploying in the field.
- Measure panel reflectance degradation of field samples over time.

Technical approach during the first 3 months:

- Establish agreement with Tucson Electric Power (TEP) and RioGlass Solar to build Solana-type trough mirrors and field test them at the TEP CSP plant .
- Model glass panels gravity deflection to optimize the mold surface figure.
- Model furnace heat transfer characteristics to optimize configuration for both heating and cooling.
- Apply anti-soil and blue boost coatings; research feasibility of applying these coatings prior to slumping.

KEY RESULTS AND OUTCOMES

- Project team up and running in this first quarter.
- CSP collaborations for lab and field tests established.
- Design of glass shaping furnace largely completed, based on modeling and lab tests of fast heating and cooling elements.
- Results significant in that detailed analysis supports the potential for fast and accurate CSP reflector shaping.
- Abstract submitted for international conference.
- Provisional patent filed.
- Australia patent issued.



Above – furnace design

Right – IR image of fast jet cooling test

NEXT MILESTONES

Mold

- Mold Design completed with Critical Design Review (CDR) and acceptance.
- Mold manufacturing plan reviewed with fabricator and accepted.
- Mold fabrication initiated.

Furnace

- Furnace concept design experiments complete; begin heater panel procurement.
- Experimental data from test furnace obtained and reviewed - decision point for further testing.

Coatings

- Subscale coating and testing initiated.