

FEA Helps Energize Solar Cells



"We chose ALGOR as a tool for developing faster, more efficient and less expensive ways to manufacture solar cells."

**Chenlei Wang, Ph.D., Senior Engineer
Solar Power Industries**

According to the U.S. Department of Energy, photovoltaic technology is becoming increasingly more affordable and available as a source of electricity. Contributing to this trend, Solar Power Industries, Inc. (SPI) of Belle Vernon, Pennsylvania, uses finite element analysis (FEA) software from Pittsburgh-based ALGOR to help improve the manufacturing process for their high-quality solar cells.

CHALLENGE

To better serve the solar energy industry's growing demand by significantly increasing the annual production capacity for processing polycrystalline silicon feedstock into completed solar cells.

SOLUTION

SPI engineers used ALGOR multiphysics software to analyze the process of casting silicon ingots inside a directional solidification furnace and to optimize the hot-zone. They first performed steady coupled fluid flow and thermal analysis on the melting phase. Then, multiple transient heat transfer analyses of the solidification phase were conducted to determine the best placement and output power for the heaters as well as the insulation lift distance. The optimized furnace allowed SPI to produce higher quality silicon ingots more efficiently with less waste, allowing increased annual production of solar cells.



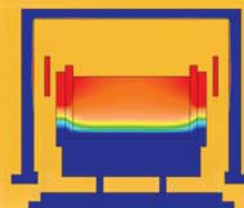
Silicon feedstock is melted and solidified inside a directional solidification furnace



Wafers are then processed in a series of steps to produce photovoltaic cells



Individual cells are joined and then laminated to produce a solar module



ALGOR transient heat transfer analysis results show the temperature distribution with optimal insulation lift, heater position and heater power level.



A rooftop solar array, which converts sunlight into electricity and feeds directly into the building's main power supply, was installed by SPI at Carnegie Mellon University in Pittsburgh, Pennsylvania.



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