Solar Energy

Solar energy (sunlight) is converted into electrical and thermal energy through a variety of collector systems.

Solar photovoltaic (or solar PV) uses flat panels, parabolic mirrors, Fresnel lenses and flexible thin film panels to collect and convert sunlight into electricity. The DC electricity generated from these sources is then converted to AC for normal daily use.

Indirect conversion of sunlight to electricity is achieved by using the sun's thermal properties to heat fluids that, in turn, create steam to supply generators with power – much like nuclear energy. Reflectors are used to focus sunlight onto heat collectors containing the fluids. These are utility grade concentrated solar operations using parabolic mirror technology.

For smaller applications such as home hot water, home heating or heating water for swimming pools, solar thermal either heats air or a fluid from roof-mounted flat panel collectors or evacuated tube collectors. The heated medium heats water that is stored in a hot water tank.

The most familiar solar product is the solar PV module – flat panels mounted to roof-tops or also found in large numbers in solar farms. These flat panels use silicone-based materials as the sun to electricity conversion material - polycrystalline or mono-crystalline silicone materials. A growing percentage of these flat panels are being made from thin-film materials and are similar in form and function, except the solar conversion materials are made from a thin film substrate that is deposited in layers onto a panel. The most common size panel of this design is approximately two feet wide by four feet long; much smaller and larger panels are made as well.

Manufacturing processes and equipment

Materials such as silicone, butyl, polyurethane and others are used in the manufacturing process of the solar PV module, flat panels and thin film panels. The Graco Therm-O-Flow 20 is used to bond the junction box (or j-box) onto the back panel of the collector with a silicone hot melt material. The junction box usually gets potted with a two-component silicone or polyurethane. The Graco PR70 Meter, Mix and Dispense System is specified for this process. Primary sealants, used to protect the solar substrates from moisture, are dispensed with a Graco Therm-O-Flow 200 using a hot applied hybrid butyl material. Some panels require a secondary sealant that is usually a single-component silicone and is dispensed with a Graco Supply System. Flat panel collectors are usually mounted to stationary roof systems or on a tracking system that follows the sun's path. In certain instances, a mounting rail or pad configuration is bonded to the collector's back panel. Graco Supply Systems and PGM Metering Systems are used to dispense the silicone adhesive.

Solar flexible thin films use sealants around the perimeter of the flexible panel; these are dispensed with the Graco Therm-O-Flow 200 and a Graco PGM Metering System.

Solar thermal industrial and home collectors use insulation on the back side of the heat exchangers within the panel. Graco foam dispensing equipment is used to fill the void with a rigid foam insulation layer and to insulate hot water storage tanks. Silicone sealants are used to seal the front glass panel (glazing) to the frame. CheckMate pumps with hand held applicators are used for manual processes; the Graco PCF Metering System is used for automated processes.

Concentrated utility scale solar products include parabolic mirrors that focus the sun's energy onto a heat exchanger tower where a fluid (oil) is super heated. The heated fluid then boils water to create the steam to run the electric generating turbines. Graco equipment is used to dispense the silicone adhesives to bond mirrors to mounting brackets.