THE SOLAR COMPONENT LIBRARY (GENERAL DESCRIPTIONS)

TYPE 536: LINEAR PARABOLIC CONCENTRATING SOLAR COLLECTOR

Type536 models a type of solar collector called a linear parabolic concentrator that is commonly used in high temperature applications. In the simplest form of a linear parabolic concentrator, fluid passes through a long evacuated tube that runs along an east-west axis and is horizontal to the plane of the ground or which runs on a north-south axis and is in a plane tilted with respect to the ground. The Type536 parabolic concentrator is modeled based on theoretical equations developed in Solar Engineering of Thermal Processes.

TYPE 537: FLAT PLATE SOLAR COLLECTOR WITH A VARIABLE SPEED PUMP TO MAINTAIN A DESIRED OUTLET TEMPERATURE

Type537 models a standard flat plate, quadratic efficiency solar collector based on theoretical equations developed in Solar Engineering of Thermal Processes. The flat plate collector is assumed to incorporate a variable speed pump and a control system that adjusts the flow rate of fluid through the collector to maintain a user desired outlet temperature. The model is equipped with minimum and maximum flow rates for the pump; if the calculated values of these parameters are exceeded, the temperature of fluid exiting the collector will not be equal to the user requested temperature.

TYPE 538: EVACUATED TUBE SOLAR COLLECTOR

This component models an evacuated tube solar collector with either a variable speed pump to keep the outlet temperature at a user-defined value or a constant speed pump with a variable outlet temperature.

TYPE 539: FLAT PLATE COLLECTOR WITH CAPACITANCE, VS PUMP AND EFF = $f(T_{IN})$

This component models a flat plate solar collector which considers capacitance effects and includes an option for a variable speed pump to keep the outlet temperature at a user-defined value if possible. The collector performance equation is based on the difference between inlet fluid temperature and ambient temperature.

TYPE 540: FLAT PLATE COLLECTOR WITH CAPACITANCE, VS PUMP AND EFF = $f(T_{AVE})$

This component models a flat plate solar collector which considers capacitance effects and includes an option for a variable speed pump to keep the outlet temperature at a user-defined value if possible. The collector performance equation is based on the difference between average collector plate temperature and ambient temperature.

TYPE 541: FLAT PLATE INTEGRAL COLLECTOR STORAGE (ICS) SYSTEM

This subroutine models an integral collector storage (ICS) domestic hot water system with or without an immersed load-side heat exchanger. In this model, the ICS system is basically a liquid-filled rectangular "box" with a solar collector located directly above it. The fluid in the box is in contact with the collector's absorbing surface and heat is transferred to the fluid in the box and then to the fluid in the immersed heat exchanger (if present) when solar radiation is incident upon the collecting surface.

TYPE 543: SINGLE COVER TOP LOSS MODEL

Type543 performs a combined radiation and convection energy balance on a plate of known temperature that is separated from an ambient temperature (for convection calculations) and an effective sky temperature (for radiation calculations) by a single sheet of cover material. The model iterates to balance energy and to converge upon a cover temperature. Wind effects on the outer cover surface are modeled. This model can be used to calculate a time dependent top loss coefficient for solar collector models that take top loss coefficients as an input (as is the case with the TESS Integral Collector Storage (ICS) models). The energy balance methodology of this component was developed at the National Renewable Energy Laboratory.

TYPE 544: DOUBLE COVER TOP LOSS MODEL

Type544 performs a combined radiation and convection energy balance on a plate of known temperature that is separated from an ambient temperature (for convection calculations) and an effective sky temperature (for radiation calculations) by two sheets of cover material. The model iterates to balance energy and to converge upon a temperature for each of the two covers. Wind effects on the outer cover surface are modeled. This model can be used to calculate a time dependent top loss

coefficient for solar collector models that take top loss coefficients as an input (as is the case with the TESS Integral Collector Storage (ICS) models). The energy balance methodology of this component was developed at the National Renewable Energy Laboratory.

TYPE 550: TUBULAR INTEGRAL COLLECTOR STORAGE (ICS) SYSTEM

This component is intended to model an integral collector storage system; a solar collector design where the collector and storage sections of a typical solar domestic hot water system are combined into one unit. The model is intended to be applied to ICS systems that store fluid in several tubes that are connected in series and placed within a collector enclosure.

TYPE 553: UNGLAZED FLAT PLATE COLLECTOR (EFFICIENCY COEFFICIENT METHOD)

This component models an unglazed flat plate solar collector where the collector efficiency coefficients are known. This model relies on algorithms supplied by the solar collector text: Solar Engineering of Thermal Processes by Duffie and Beckman.

TYPE 559: THEORETICAL UNGLAZED FLAT PLATE COLLECTOR

This component models an unglazed flat plate solar collector where the collector efficiency coefficients are calculated from theoretical models. This model relies on algorithms supplied by the solar collector text: Solar Engineering of Thermal Processes by Duffie and Beckman.

TYPE 561: UNGLAZED AIR HEATING COLLECTOR

This component is intended to model an un-glazed solar collector that passes air behind the absorbing plate. Moist air calculations are not included in the model. The thermal model of this collector relies on algorithms supplied by the classic Solar Engineering of Thermal Processes textbook by Duffie and Beckman.

TYPE 564: THEORETICAL FIN / TUBE SOLAR COLLECTOR (POOL HEATER)

This component models a tube-fin solar collector based on algorithms presented by Duffie and Beckman in chapter 6 of their book Solar Engineering of Thermal Processes.

TYPE 565: THEORETICAL SERPENTINE TUBE SOLAR COLLECTOR

This component models a serpentine tube-fin solar collector based on algorithms presented by Duffie and Beckman in chapter 6 of their book Solar Engineering of Thermal Processes.