Theoretical flow investigations of an all glass evacuated tubular collector

Heat transfer and flow structures inside all glass evacuated tubular collectors for different operating conditions are investigated by means of computational fluid dynamics. The investigations are based on a collector design with horizontal tubes connected to a vertical 14 manifold channel. Three different tube lengths varying from 0.59 in to 1.47 in have been modelled with five different inlet mass flow rates varying from 0.05 kg/min to 10 kg/min with a constant inlet temperature of 333 K. Under these operating conditions the results showed that: the collector with the shortest tube length achieved the highest efficiency, the optimal inlet flow rate was around 0.4-1 kg/min, the flow structures in the glass tubes were relatively uninfluenced by the inlet flow rate. Generally, the results showed only small variations in the efficiencies. This indicates that the collector design is well working for most operating conditions.