PREFACE

In the present work flow distributions in a solar collector array in parallel has been studied. A mathematical model has been derived for symmetric (U-manifold) and asymmetric (Z-manifold) flow configurations. The model has been verified by experiments by measuring the flow rates using electrochemical technique, which is known for its accuracy and repeatability. The agreement between theory and experiment has been found to be excellent.

The effect of collector flow rate and area ratio on the flow distributions has been discussed in details. The manifold pressure distribution for each case has been illustrated which clearly explains the cause of maldistribution. The flow distribution has been correlated to the collector array efficiency. This enabled determination of number collectors which can be placed in parallel both for symmetric and asymmetric such that the reduction in the collector array efficiency is less than, say, 1 %. Both symmetric and asymmetric flow configurations with an area ratio of 0.05 have been recommended for upto 10 collectors in parallel for the baseline collector and flow rate.

The area ratio has been found to be the most important

parameter affecting the flow distribution. This observation has been used to balance the flow in a large solar collector array by employing a low area ratio. This method can be extended to 15 - 20 collectors in parallel. This method of balancing is simple since it involves optimised design of the collector, unlike ones used earlier such as orifice inserts or restricting number of collectors in parallel.