

# **DESIGN DEVELOPMENT AND PERFORMANCE EVALUATION OF CAVITY RECEIVER FOR FUZZY-FOCAL DISH CONCENTRATOR**

## **ABSTRACT**

Research and development exercises over the years have established solar energy as a potential source of renewable energy. This assumes significance especially in view of fast depleting fossil fuel reserves and increasing concern towards environment. Design, development and results of performance tests on cavity receiver for dish concentrator with imperfect optics are presented in this report. Dish concentrators are able to concentrate the dilute solar heat over a very small area. Advancements in manufacturing technology and material research have resulted in novel point concentrating devices such as multi faceted paraboloidal concentrators, stretched membrane single facet concentrators and stretched membrane multifaceted concentrators. Unit cost for dish concentrators increases steeply with concentrating ability for large aperture dishes. Fuzzy focal dish concentrators are substantially economical. Design of receiver for such concentrators requires detailed knowledge of intensity variation in the aperture plane of receiver. Exponential and statistical approximations for obtaining flux distribution in focal images are available in literature. These approximations are inappropriate in case of dish concentrators with higher degree of optical fuzziness. An analytical model to determine the flux distribution in focal image has been developed and reported here. Cavity receivers have been designed and fabricated based on this model and thermal analysis, with consideration for various losses. Thermal performance of receivers has been assessed by field experiments. Performance parameters such as thermal efficiency and quality of heat show potential applicability of concentrator-receiver system in fields such as cooking and process steam generation.