International J.of Multidispl.Research & Advcs. in Engg.(IJMRAE),
ISSN 0975-7074, Vol. 2, No. I, April 2010, pp 233-244

# PLANNING OF EXPERIMENTATION TO OPTIMIZE PERFORMANCE OF α - CONFIGURATION STIRLING CYCLE REFRIGERATION SYSTEM

**S.K.CHOUDHARY, R.D.ASKHEDKAR AND J.P.MODAK**

**Abstract**

A refrigeration system working on vapour compression refrigeration system (VCRS) uses Chloro - Fluoro Carbon (CFC) as the working fluid which are prominent ozone depleting substances (ODS) and are causing damages like skin cancer, cataract, damage to human body immune systems, retardation of plant growth, destruction of marine life etc and also cause global warming. As per Montreal Protocol, CFC group of refrigerants should be banned after year 2010. Alternative of it is Hydro Chloro - Fluoro Carbon (HCFC ) group of refrigerants which decreases ODS but it increases the global warming and as per Kyoto protocols HCFC group of refrigerants should be banned after year 2030. So a refrigeration system working on environment friendly gases, is to be developed if Montreal and Kyoto Protocols are to be satisfied. The solution of this problems lies in developing a refrigeration system which uses a greenhouse gas as refrigerant. Stirling cycle refrigeratim system may be one of the solutions to the problem. Presently, Stirling cycle with β & γ configuration are used in cryogenic applications. Due to the high cost of the system, it can not be use for simple refrigeration purpose. A model of α configuration Stirling Cycle refrigeration was designed by using thumb rule method in absence of any design data and fabricated. During its testing temperature of $1^0$c is achieved with air as working fluid and water as secondary refrigerant. This experimentation proved the feasibility of α configuration Stirling Cycle refrigeration system. For commercialization of the system it is necessary to develop a economical refrigeration system working on α configuration Stirling Cycle with high Coefficient of Performance (COP). This paper reports the planning of classical experimentation to optimize the performance of α configuration Stirling Cycle refrigeration system to generate the design data for further design of the system.

---

**Keywords :** Stirling cycle, Refrigeration, Classical Plan of Experimentation, Coefficient of Performance

**Subject Classifications :** Refrigeration