ABSTRACT

In the present era of globalization, products in the market are continuously undergoing modifications to have improved features and a longer life. There are many manufacturers of the same product in the market. It generates a lot of competition amongst all the competitors to launch their product with a higher durability and reliability so that their products get an edge over the competitors and captures a bigger market share.

The domestic refrigerator is one such product which is manufactured by a large number of companies and is available in the market with different brand names. These brands always vie to capture the market share by enhancing the product quality and reliability.

The domestic refrigerator has become a basic necessity in a country like India which experiences a long and very hot summer season. Even in winter also it is needed for food preservation. This research basically focuses on enhancing the reliability of domestic refrigerators. Chapter 1 gives a brief introduction about domestic refrigerator describing its technical fundamentals and market scenario and trends. In order to frame the objectives of the current research, a large number of research papers concerning this study were referred. After a careful perusal of the research papers, the research technique was decided and adopted. The summary of the research papers studied and objective statement are incorporated in Chapter 2 entitled Research Methodology. The point of interest of the exploration approach is utilized. The description of year wise data collection of failures/ faults in the domestic refrigerators from the service station and the calculation of the reliability of various components of the refrigerators with the help of VENSIM-PLE modeling software is presented in Chapter 3.

This dissertation is basically aimed at suggesting ways to enhance the reliability of domestic refrigerators. To achieve this performance of a huge quantity of domestic refrigerators over a time of 15 years was studies and failure data of its components were collected during the
same period from a refrigerator service center. In the thesis, nothing has been copied directly from previously published or collaborative articles. In this research overall reliability of domestic refrigerator is enhanced by applying the method of redundancy for each main component like Evaporator, Compressor, Condenser and Expansion Device of vapor compression refrigeration system used. Chapters 4 describes the technique to enhance the reliability of Evaporator, Chapter 5 deals with compressor, Chapter 6 is about Condenser and Chapter 7 deals with Expansion devices used in the domestic refrigerator.

Chapter 8 presents the details of the research findings. It includes the comparison of reliabilities of all the four major components by both graphical and analytical methods. Chapter 9 summarizes the results with discussions and presents the conclusion of this research work. Lastly, Chapter 10 throws light on the scope of this research work in the present scenario in detail. It also presents the future prospects of this study.

The main findings of the study are as follows; (i) a new technique of dynamic systems, through which the reliability of refrigeration system at any time of its functioning can be found, was used to compute reliability of VCR type domestic refrigerators, (ii) the average reliability of different components and the system as a whole for a sample of 216 VCR type domestic refrigerators was computed. As time progresses the reliability is found to drop every year in a progressive manner, (iii) the concept of redundancy was suggested and employed. The modified annual reliability of all the parts and the framework all in all with redundancy was computed and (iv) with the introduction of redundancy, a significant improvement in the system reliability with marginal increase in the cost was obtained.