Fuzzy Reliability Analysis of a Multi-Chiller System based on Modern Analytics

Harendra Yadav, Nitesh Dhiman and M. K. Sharma
Department of Mathematics, Chaudhary Charan Singh University, Meerut
Email:

V. P. Pande
Department of Mathematics, IFTM University, Moradabad, U.P., India
Email:

Abstract: Cooling systems are important part of our day-to-day life in summer season. In cooling systems, most challenging part is to consume the less energy with longer reliability. A multi-chiller system is analyzed in the present work. In the present problem, a fuzzy logic-based approach is used to evaluate the fuzzy reliability of multi-chiller system. The reliability of a multi-chiller system depends upon the failure with the partial (part) loading ratio (PLR). PLR is taken as fuzzy parameter in this work. In this work we also compared the results of the approach Lagrangian Method (LGM), Genetic algorithm (GA) and Teaching learning-based optimization (TBLO) with our proposed approach.

Keywords: Fuzzy logic, Fuzzy failure rate, Partial load ratio (PLR), Multi-chiller system, Fuzzy reliability.

1. Introduction

A system is made up of many components or subsystems. Therefore, failure of any component or subsystem may lead to the system performance or its working capacity. Sometimes, system may be in completely fail state. The failure of systems affects the reliability. The reliability of systems is always being the topic of interest.There are many complex systems in various industry/factory, institutions and home appliances, which can be made more reliable using new methods/techniques.A chiller is responsible to remove heat from a liquid by absorption cycle or vapor compression. A chiller system is the main unit/part of our cooling systems like air conditioners and refrigerators. In multiple layered chiller system, there are two or more chillers