

## Abstract

Optimization techniques are applied largely in iron and steel making process to solve complicated real world problems. The methods and models are regularly used in this field to determine the optimum values in terms of cost, quality, quantity and effectiveness of the process. In the present scenario steel industries have been using evolutionary algorithms to solve complicated multi-objective blast furnace optimization problems. The operational data are gathered from regular plant operation and used to generate meta models. These models are used to solve complicated and complex many objective problems by using population based approach. In this work evolutionary data driven techniques like evolutionary neural network (EvoNN), bi- objective genetic programming (BioGP), evolutionary deep neural network (EvoDN2), constraint based reference vector evolutionary algorithm (cRVEA) and few modules of KIMEME commercial software are used to generate the training models as well as to perform the optimization work. The parametric optimization like bi-objective, tri-objective and many objective optimizations were done using several decision variables simultaneously in blast furnace iron making process. The crucial parameters like production rate, gas flow, tuyere velocity, heat loss, coke rate, silicon content, CO<sub>2</sub> emission, carbon rate, fuel cost, top gas volume, oxygen enrichment, raceway adiabatic flame temperature (RAFT) and injection of fuel were emphasized in this research. Time series analysis was also added to evolutionary data driven modeling process to bring improvement in model generation. Simulator based data generation with data driven modeling was also worked out for few parameters in bi-objective and tri-objective mode and the optimized results provides some useful information in parameter control during the blast furnace operation. The results and the comparison between various models are thoroughly examined and a discussion regarding these data driven models and their influence in the blast furnace iron making process are presented in a scientific manner.

**Keywords:** Blast Furnace; evolutionary computation; genetic algorithm; genetic programming; neural network; reference vector.