Abstract ID 1140

REVERSIBLE COLD MILLING PROCESS TIME OPTIMIZATION FOR AN INDUSTRIAL APPLICATION

Kanan Aghayev(1), Ali Öztürk(1), Selim İlker(2), Adil Orta(1), Kaan Esendağ(1), Eda Kızıltaş(2)

(1)Borusan R&D, Turkey
knn.agayv@gmail.com, aliozturk@borusan.com, aorta@borusan.com, kesendag@borusan.com

(2)Borcelik Celik Sanayii Ticaret A.S., Turkey
silker@borcelik.com, eckiziltas@borcelik.com

Keywords: Genetic algorithms (GA),Optimization,Reversible Cold Milling,Advanced Statistical Model,Artificial neural network

Abstract: Reversible cold milling is a widely used industrial process for metal forming. It consists of backward and forward motion of the sheet metals between the rolling mills. As the process is highly automated, optimization of the process parameters is essential for cost minimization. However, it is a complex optimization problem because maximization of the rolling speed increases the motor mill currents and rolling force, and physical constraints of the line may not allow to achieve that. For optimization process, rolling speed, rolling force and motor mill currents of the line should be predicted to check whether they are in physical limits or not. These parameters strongly depend on sheet metal properties (width, thickness, reduction ratio), material properties (yield strength, tensile strength), and other line parameters (oil types, mill radius, front and back tension). For the prediction of the line parameters, neural networks and advanced statistical methods are used. Layer structure, backpropagation functions, and regression methods are changed to increase the precision and the speed of the models. Then, the prediction models are tested and compared with the measured data for verification. After the prediction process, a genetic algorithm (GA) is developed to minimize the total process time by determining the reduction ratio of the sheet metal in each pass process. In each iteration of GA with the fitness function based on an advanced statistical model, reduction ratio of the sheet metal in each pass process is changed while satisfying physical constraints. Thus, the processing time of the reversible cold rolling process is minimized without violating the physical constraints of the line. The results show that the combining of GA and statistical models is an effective tool for process parameter optimization of reversible cold milling.