Topmost steel production design by using artificial neural network through process modeling

Tadej Kodelja[1], Igor Grešovnik[1,2], Robert Vertnik[2,4], Božidar Šarler[1,2,3]

[1]Center of Excellence BIK, Solkan, Slovenia, [2]Laboratory for Multiphase Processes, University of Nova Gorica, Nova Gorica, Slovenia, [3]IMT, Ljubljana, Slovenia, [4]Štore-Steel Technical Development, Štore, Slovenia
E-mail: tadej.kodelja@cobik.si

Artificial neural networks (ANNs) have been used in this work as an alternative to physics based numerical modeling [1-2] for computing the final mechanical properties of steel semi products. Production of steel bars for application in forging, spring and engineering industries in Štore Steel company has been used as a demonstration of this new methodology, for the first time applied in the through process modeling of steel [3-5]. The complete process path consists of six processes: melting of steel, continuous casting of steel, hydrogen removal, reheating, rolling and finally cooling on cooling bed. Two open source ANN libraries have been used (Aforge and NeuroDotNet). Both libraries contain neural computing elements that have the ability to respond to input stimuli and to learn to adapt to the environment [6]. The process path is completely defined by 123 process parameters. The approximation model was built on the basis of 34 process parameters that turn to be influential and also vary over the data used. Five output values were observed: elongation, tensile strength, yield stress, hardness after rolling and necking. The results obtained in parametric studies based on the ANN based model seem consistent with expectations based on industrial experiences. However, further improvements in data acquisition and analytical procedures are envisaged in order to obtain a reliable enough methodology for use in the everyday industrial practice.

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