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Evaluation of laser cutting process with auxiliary gas pressure by soft computing approach

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Highlights

- Evaluation of the optimal laser cutting parameters for the high cut quality.
- Highly nonlinear process with different parameters.
- Support vector regression (SVR) is implemented.
- As a laser type TruLaser 1030 technological system was used.
- Data mining prediction accuracy was very high.

Abstract:

Evaluation of the optimal laser cutting parameters is very important for the high cut quality. This is highly nonlinear process with different parameters which is the main challenge in the optimization process. Data mining methodology is one of most versatile method which can be used laser cutting process optimization. Support vector regression (SVR) procedure is implemented since it is a versatile and robust technique for very nonlinear data regression. The goal in this study was to determine the optimal laser cutting parameters to ensure robust condition for minimization of average surface roughness. Three cutting parameters, the cutting speed, the laser power, and the assist gas pressure, were used in the investigation. As a laser type TruLaser 1030 technological system was used. Nitrogen as an assisted gas was used in the laser cutting process. As the data mining method, support vector regression procedure was used. Data mining prediction accuracy was very high according the coefficient (R^2) of determination and root mean square error (RMSE): $R^2=0.9975$ and $RMSE=0.0337$. Therefore the data mining approach could be used effectively for determination of the optimal conditions of the laser cutting process.

Keywords: laser cutting, electrical steel, auxiliary gas pressure, optimal process.

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