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**Modernizacja produkcji elektrody zbiorczej dla przemysłu
energetycznego**

Rozprawa doktorska

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Abstract

The paper entitled "Modernisation of the production of the collecting electrode plate for the energy industry" deals with the issue of producing collecting electrode panels being a component of an electrostatic precipitator. The subject matter of the research is focused upon the development of a new product feasibility study, which comprises technical and economic analysis, as well as market analysis together with the risk assessment of an investment project.

The research is based on the hypothesis that it is possible to develop and put onto the market a new collecting electrode plate whose mass has been reduced, while at the same time its utility value has been preserved and the unit cost of production reduced. The development project and its implementation resulting in the production of the optimised product leads to the improvement of the company's competitiveness, as well as to strengthening its market position.

The indicators of material and energy consumption of the production process, as well as the company's operating profit may be significantly improved by the implementation of the proposed modernisation changes in the area of the machinery park of a production company.

The paper focuses upon the development of a project of the collecting electrode plate employed in an electrostatic precipitator, and looks at the analysis of the process data, in particular at the study of the impact of the technological input parameters on selected tolerances of manufacturing the complete product.

The task involved designing stations for multi roll forming processes intended for 3 types of collecting electrode plane profiles, i.e. Sigma III, ZT24 and trough. The modelling of profiling was carried out for 3 grades of steel: DC01, Corten A and stainless steel 1.4541, and for 3 thicknesses of strip: 1.5, 1.25 and 1.0 mm.

The paper utilises the process data provided by a large energy consortium. What is an important part of the paper is an in-depth statistical analysis of the technological properties of the charge, the geometric features of the complete product, and their mutual correlations.

For the purpose of the research, the following were employed: MS Excel spreadsheet, Minitab an advanced software for data analysis, and software supporting engineering calculations, i.e. COPRA RF, COPRA FEA, and GOM Inspects.

Basing on the research results, it was concluded that it is feasible to develop the stages of the complex process of designing and manufacturing an electrode with a thinner thickness, starting from the analysis of the existing technological line and the properties of the technological charge, through the designing of multi roll forming stations, and carrying out simulations of the bending process, up to the initial examination of the geometrical features of the product, and the inspection of a selected functional property determining the effectiveness of removing collected ashes. The conducted economic analysis confirmed the profitability of such modernisation.

Keywords: collecting electrode, multi roll forming process, analysis of the process data, technical and economic analysis of the production process, risk assessment of the investment project