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Defining the damaging process of cereal grains on the basis of artificial neural network

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Złobecki A., Francik S.

Department of Machine Design, University of Agriculture, Balicka 104, 30-149  
Cracow, Poland

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abstract The objective of the research consisted in the development of a model allowing to forecast the damage attributable to wheat grains under the impact of multiple dynamic loads. Laboratory research which provided the model basis was effected for two types of grain stress: through random unsupported impacts inflicted on grains by a rotating arm, and in a second experiment loading the grains on support. In the course of the research, the following variables were altered: energy, number of impacts and water-content in grains. Two models were developed, relying on feed-forward three-layer artificial neural networks (ANN). One of the networks provided the model of the phenomena occurring in the course of unsupported impacts to grains, while the other reflected the impacts on supported grains. In the model of loads effected on unsupported grains, the network had the following features: 14 neurons in the first layer, 9 neurons in the second and 1 neuron in the third layer. In the case of supported grain impacts, the network was as follows: 7 neurons in the first and second layers, and one neuron in the third. The obtained models were verified by comparing the precision level of ANN with the existing empirical models. The comparative analysis of the relative error terms obtained, showed that the values of error obtained for regression analysis were higher than the values obtained for ANN.

keywords grain damage, multiple dynamic loads, artificial neural network