



International Scientific Conference “Environmental and Climate Technologies”, CONECT 2015,
14-16 October 2015, Riga, Latvia

Results of using neural networks for technological processes control of iron mill

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Abstract

The article deals with the problem of optimization complex processes of mining and processing complexes of the Republic of Kazakhstan. In the article characteristics of used control systems were analyzed and it revealed the necessity of the use of non-existing approaches to "fine" adjustment of adaptive control systems. On the basis of the research the author proposes the structure of an adaptive control system grinding process, built using an artificial neural network with radial basis function. To evaluate the effectiveness of the developed system was evaluated reducing power consumption parameter and was proved the possibility of reducing power consumption using the system by 6.9 %.

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Peer-review under responsibility of Riga Technical University, Institute of Energy Systems and Environment.

Keywords: process optimization; resource; adaptive control; artificial neural network

1. Introduction

The innovative development of industrial enterprises at present is inconceivable formation of an effective management system. And the main focus at all levels of governance and management should be focused on the most efficient use of material, labor and financial resources, natural resources, the elimination of unnecessary costs and losses. These issues are pivotal in solving problems of the modern enterprise management.

Despite the background of research in the field of construction of automatic control systems, these issues remain relevant at the moment. At the same time, the development of neural networks section gives grounds to

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assume that such a control system can be designed and it is effective on artificial neural networks as a neural network focused on the processing of large amounts of information, including semistructured, capable of learning and adapting [1]. There are developments on application for neuroregulators metallurgy [2], electrical power engineering [3], machine engineering [4]. However, today, there are many unresolved issues for the use of artificial neural networks [5, 6].

This article presents the results of the development adaptive optimal control system of technological process of iron ore grinding in a rod mill, built on the neural network. The development of automatic control system and analysis of the effectiveness of system produced for processes of crushing iron ore in rod mills in the largest plants of the Kazakhstan - "Sokolov-Sarbai ore-dressing production association" ("SSGPO") and "Orken". Application of the results of this paper will enable enterprises to reduce the cost of industrial product, partially solve the problems of optimization of technological processes.

The work was performed as part of the Republic of Kazakhstan state grant 0113RK00617 on "Developing self-learning adaptive automatic control system of mining and processing equipment to optimize production processes in the conditions of instability of input parameters".

2. Methods

For nowadays manufacture has accumulated time for the production of large amount of data "input-output" with the control apparatus of the process equipment. For example, the factory of wet magnetic separation "SSGPO" these data is presented in the form of protocols of the system Contronic [7]. Gathering information on the volume of incoming ore implemented by automated operational dispatch management system (AODMS) used in "SSGPO". Information on the process of grinding in a rod mill was obtained according to the protocols of the system Contronic. Measuring instruments were weighing by conveyor VER-10, water meter PROMAG-30.

In work the data protocols we converted to specific energy consumption and specific performance (Fig. 1).

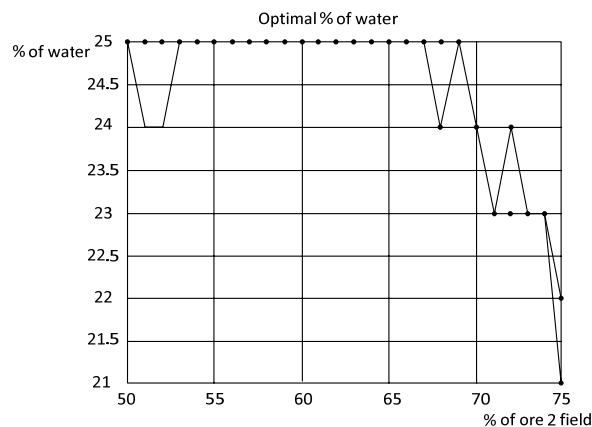


Fig. 1. The optimal ratio of "ore / water", for different ore deposits proportions.

For information processing package was used MATLAB ver.10. and toolbox Simulink. A comparative analysis of the existing automated control system and the proposed adaptive system implemented through computer simulation with the same input and evaluation of the effects of two models of studied systems.

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