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Interactive Educational System – Virtual Simulator "Sheet Rolling"

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Abstract

The article reports on the experience of modern computer technologies for increasing level and quality of education for specialists of engineering and metallurgical industry. The interactive virtual simulator "Sheet Rolling" has been created by using Unity3D, SolidWorks and 3Ds Max programs. This article gives a short modules description which are included in a part of the simulator, namely: "Basic provisions". There is information about the theory and technology of sheet rolling which is given systematically; the module of the mechanic "Sheet rolling mill" allows exploring the equipment of cold rolling sheet; the technologist's module "Cold sheet rolling" which is based on the mathematical model of cold sheet rolling process provides a possibility of carrying out analytical researches; and also “Examination module” consists of tasks and tests, which allow getting the objective information about the level of knowledge.

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Keywords: rolling mill; cold rolling sheet; interactive educational system; virtual simulator; Unity3D; SolidWorks; Visual Studio; 3DMax.

1. Introduction.

There are more and more opportunities for creation of interactive virtual laboratory stands, installations and simulators with development of computer technologies. Use of such technologies during educational training allows not only to reduce financial costs, but also to increase appeal of educational process [1]. Besides, differential, organic and realized using of both virtual laboratory stands and real laboratory stands are allowed to optimize and intensify educational process. However, it should be noted, that using the interactive laboratory installations must be differentiated and must not be replaced in full the real laboratory and practical training. For getting all necessary knowledge and abilities, a student is obliged to have an opportunity to work with real objects. At the same time, if

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there is no such opportunity, because of equipment's dimension, complexity and danger of processes, it will be better to resort for simulation of real objects.

In the curricula at universities, colleges and technical schools for preparing specialists in the field of metallurgical mechanical engineering is paid much attention to the courses of "Metallurgical Equipment" and "Metallurgical Technologies". The mill of cold sheet rolling is one of the key objects studied within these courses. Traditionally for understanding the principle of working process of structure, power indicators of a mill at the lecture and practical educational training are used methodical literature, schemes, slides and movies. It is caused by the fact that many educational institutes can't afford to have available operating rolling mill for various reasons.

The interactive virtual simulator "Sheet Rolling" which raises the quality of training for specialists of engineering and metallurgical industry has been made for the purpose of increasing the level of educational institutes with laboratory and practical basis by introducing the innovative developments.

2. Description of the interactive virtual simulator "Sheet Rolling"

The interactive virtual simulator "Sheet Rolling" (fig. 1) is based on data of really operating cold rolling mill "1700". The simulator consists of two main modules: the module of mechanic simulator "Sheet rolling mill" and the technologist's module "Cold rolling steel", and also includes basic provisions of the theory and technology of sheet rolling and control of gained knowledge (fig.2).

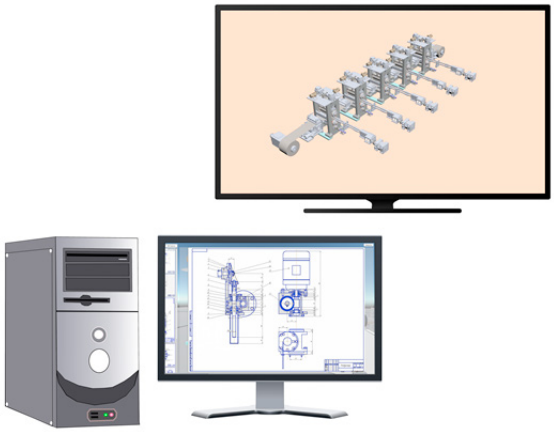

Fig. 1. Appearance of the Sheet Rolling simulator.

Solid Works and 3DsMax for drawing of cold rolling mill components and system of development of the 3D Unity3D applications with Visual Studio have been used as a software for project realization. The Sheet Rolling Mill module is the simulator for equipment studying. This module allows to study the operation principle, details and units of the equipment, and also allows to use skills of the rolling cage assembly disassembly and the main line of the sheet rolling mill. There are drawings of rolls, beds, couplings, spindles, gear cages, rolling bearings and other components of the rolling mill main line as a part of simulator.

The Cold Sheet Rolling module is intended for technological process studying. This module allows to research influence of sheet rolling technological parameters on power parameters of process, physicomechanical properties and geometrical characteristics of a sheet. It allows visually verify form changes and the sizes of metal in the processing of deformation and provides information in visual and convenient way for analysis: schedules, tables, drawings.

Besides, there are modules in convenient form for studying as a part of simulator, which are presented theoretical material about the equipment and technological bases of cold sheet rolling, tests, control questions and tasks.