DESIGN, MODELING AND SIMULATION OF AN AUTOMATED SYSTEM FOR OPEN-FRONT POWER PRESSES

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ABSTRACT

Power Presses produce a variety of similar articles in large quantities through presswork operations. In Kenya, many manufacturers have manually operated Open-front Power Presses which have low productivity and attendant safety hazards to operators.

The purpose of this study was to simulate a computer-aided automation system for open-front power press operations to achieve higher output and eliminate manual operation which has attendant operator safety hazards. This was achieved by designing a linear press cell that gave a production range of 7-19 working strokes per minute(SPM).Comparing this with the manual production of a standard building shovel study case which is produced at an average rate of 2 strokes per minute(SPM), simulation of the automatedOpen-front Power Presses gave an output improvement of at least 350% when the Press is loaded to the maximum allowable limit of 15% velocity loss.The algorithm and equations of the system weredeveloped and modeled inthe Matlab-Simulink environment in the form of function M-file and M-file S-function codes with the latter being accessed through Simulink models.

The Simulink models were interfaced to 3D models built in V-Realm Builder2.0 software through the virtual reality toolbox. Simulation of the function M-file codes gave graphical outputs while simulation of the M-file S-function code driven Simulink models gave both graphical and 3D virtual reality animation outputs.However, signal attenuation was experienced at speeds higher than 10units/s for Simulink model scope outputs while signal attenuation was not experienced over the speed range in function M-file graphical outputs. Also, 3D virtual reality simulation results showed that the M-file S-function driven Simulink model resulted in animation distortions in the form of extraneous linear and rotary displacements in the X and Z directions.

The results of this work enabled the modeling and simulation of the automation system for manually operated Open-front Power presses. In Academia, it can be used for making 3D animation demonstration models for teaching and learning in colleges and schools while in industry, modeling and simulation of a design will eliminate expensive design errors before committing actual resources in hardware implementation. This work is therefore a template for automation of manually operated Open–front Power Presses.

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