

WYDZIAŁ MECHANICZNY TECHNOLOGICZNY

Politechnika Śląska

ROZPRAWA DOKTORSKA

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**Metoda parametryzacji i doboru algorytmów
sterowania przenośników zgrzebłowych**

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Method of parametrization and selection of control algorithms for AFC's

Abstract

Armoured face conveyor as the machine providing transportation of run-of-mine from the longwall system, is one of the strategic machines in this system. Due to uneven load to the conveyor, related to diversified stream of run-of-mine, the conveyor is exposed to many unfavourable dynamic phenomena. Such phenomena are: state of loosening or excessive tension of a scraper chain or uneven load of its drive motors. The control algorithm, which makes regulation of specified operating parameters possible, was developed to minimize the risk of occurrence of unfavourable work states of the conveyor. There are 37 work states defined in that algorithm and the control rules for each of them. The developed control algorithm consists of two parts. The first one contains the rules aimed to minimize the risk of states of loosening or excessive tension of the scraper chain. Elimination of the cases in which one of the motors is loaded through the scraper chain by another one at the opposite end of the conveyor is another function of this part of the algorithm. The second part of the algorithm was developed to make it possible to adjust the velocity of scraper chain movement to the current loads in order to decrease the frictional wear of the conveyor's components. The parametrical computational model of the conveyor was developed to identify the effects of changing specified operating parameters. This model contains three subsystems: a physical model of the conveyor, a model of driving motors with frequency converters as well as a model of control system. Defining the I/O signals from each of the models and applying the co-simulation technique let the subsystems integrate and conduct the simulation of the influence of changing specified operating parameters to conveyor's behavior and determine the state of its work. This model was used to verify the correct operation of the developed control algorithm. The method of tuning the control algorithm to the selected conveyor is also presented. The algorithm tuning process includes: installation conditions of the conveyor (horizontal, downward transportation of run-of-mine or upward transportation of run-of-mine), conveyor length, dimension of the scraper chain, numbers of the levels of the conveyor operational speed. The control algorithm of the selected operating parameters of the conveyor as well as the way of its tuning and selection has made it possible to develop the control system that simultaneously affects: improvement of the tension of the scraper chain, improvement of the cooperation of the drive motors and the ability to adjust the velocity of scraper chain movement to the current loads of the conveyor.