Wrocław University
of Science and Technology

Faculty of Mechanical Engineering

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Review of the dissertation work of Yeserkegenova Bekzat Zhambylkyzy on the topic "Development of an automatic control system for bituminous crushed stone distribution with synchronous distribution of components"
for the degree of Doctor of Philosophy (PhD)
specialty: 8D07102-Машиностроение – Mechanical Engineering.

Foreign Scientific Consultant
Prof. Dr. Hab. Eng. Marek Jan Młyńczak

The analysis and characteristics of the actually operated bituminous crusher distributors, the available practical and theoretical studies, as well as the review of information and patents were carried out by the author. The author identified shortcomings in the operation of existing distributors of crushed bitstone, outlined ways to further improve the efficiency of their work.

The subject of the doctoral thesis was the process of distribution of bituminous crushers with synchronous distribution of components based on additional elements, such as measuring transducers and actuators. These elements were necessary to create future systems. Based on the analysis of industrial bituminous splitters, the author proposed to increase the efficiency of their work by: proposing the process of distributing asphalt chips as an object of automatic control and the creation of automatic control systems (ACS) for the bitumen distribution process based on BSHR. Analysis of technical and patent information has shown that such representation of BSHR as a subject of management is new and unparalleled. At the same time, it was found that the technical and operational characteristics of mass-produced BShRs are practically exhausted and in order to implement the proposed concept, a partial modernization of their standard units is necessary.

The author listed the main tasks of the dissertation, as a result of which the following results were obtained:

- an analysis and classification of existing types and phases of surface treatment equipment were carried out and a new type of surface treatment equipment was proposed,
- two automatic control systems with flat-vacated and spherical rotary distributors have been developed,
- as part of theoretical research for the crushed flat-oscillating stone distributor, mathematical dependencies of the oscillation amplitude of the cantilever paddle blade on the variable and unchanging parameters of BCHR units were obtained,
- for the spherical crushed stone distributor, the dominant destabilizing factor was identified and mathematical relationships of the distance between the center of rotation of the drum and the center of the inner curved surface of the gate was obtained for all possible variants their mutual position,
- the obtained results of theoretical research allowed to improve the construction of plano-oscillating spherical distributors,
- a stability analysis of the closed spray control loop on the binder substrate was carried out,
- a set of technical measures has been developed, namely, metrological support for the operation of self-propelled guns in the process of distribution of crushed bitstone, a device for obtaining crushed stone of the required shape and size, a device for direct measurement of the coefficient of adhesion of a car wheel to the road,
- the functionality of the proposed technical devices was confirmed at the stands,

The goals and objectives formulated by the author, as well as the content of the dissertation itself, correspond to the topic of the dissertation. The author carried out the entire volume of theoretical, design and experimental research independently, showing good theoretical training and knowledge of mechanics, automatic control and instrumentation, relying on modern achievements in these areas, as well as on information and patent publications.

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The only disadvantage is poor experimental part which should also show practical application of achieved result in real scale machine.

The dissertation work of B.Zh. Eserkegenova is a completed scientific work. The choice of methodology, design and technological support and methods of experimental research are fully justified. The dissertation itself is presented in understandable language and well-illustrated. I especially note the high innovative, component of the dissertation work of B. Zh. Eserkegenova, the disclosure of the content of the work in two articles of the journal located in the Scopus database and having a percentile in mechanical engineering 41 at the time of publication.

This testifies the high level of scientific and engineering training of B.Zh. Eserkegenova. I believe that the dissertation work of B.Zh. Eserkegenova "Development of an automatic control system for bituminous crushed stone distribution with synchronous distribution of components" is an actual completed scientific study, has internal unity, has theoretical and practical significance.

I believe that the dissertation work of B.Zh. Eserkegenova meets the requirements of the Ministry of Health and Higher Education of the Republic of Kazakhstan for dissertations for the degree of Doctor of Philosophy (PhD) in the direction of training 8D07102-Машиностроение- Mechanical Engineering.

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