

Modeling and Software Implementation of Fibrous Waste Disposal Processes

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The basis of the mathematical model of fibrous waste disposal system is multiplicative principle of multiple calculating of the instantaneous multicomponent material balances of technological system through any specified time intervals. Since the harmful impurities accumulation in time affects the process flow, there is the necessity of continuous tuning control system. Therefore, the optimizing unit is introduced in the programming model algorithm. This unit processes the incoming information. In case of the actual situation discrepancy with the specified conditions compromise optimization problem is solved with the issuance of the necessary control pulses to the actuators. To formalize the material balances calculation procedures in the dynamics all streams are encoded in the form of a two-dimensional array. Modeling undergoes a simplified process flow diagram obtained after decomposition and aggregation of variables. It consists of 18 elements (process steps) involved in 42 material flows.

Information support and software development was based on the results of author's researches [1-2]. For product quality stochastic models built information network based on orthogonal tables, obtained by the projective geometry and Galois fields. Tables after the experiments were transformed into a table function. As linearizing transformations used the Taylor series, bicubic spline function, Chebyshev polynomials interpolations. The system dynamic model is implemented in the simulation environment AnyLogic. Specialized environment allows the user to change the model, add or remove components, change the connection between them.

To be able to control system developed with mobile devices that have limited computational resources, implemented client-server architecture, where the server performs a computation-intensive calculations, and the client is responsible for the formulation of the problems and displaying the results. For more flexibility, the system server has been implemented as a web-service that provides client its API. To work with the model two experiments were implemented: imitation and variation. The experiment is a simulation of an industrial complex in real time. Varying the parameters of the experiment is intended for database storage by the product quality results, economic and environmental criteria.

The flexibility of the program allows to identify the best combination of control factors values for selected conditions. Software not intended for immediate implementation in any enterprise and revision of existing technological regimes. The main advantage of the work is methodological components, demonstrating the possibility of technological regimes adapting to the external environment.

References

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