CONSTRUCTION OF KINETIC EQUANTIONS FOR QUASI-SYNCHRONIZED MODELS OF PRODUCTION LINES

Pihnastyi O.M., Korsun R.O.
National Technical University «Kharkiv Polytechnic Institute», Kharkiv

The model of the interaction of objects of labor with technological equipment is the basis for the derivation of the kinetic equation[1], which describe the state of the production line introduced numerical characteristics. Modeling complex dynamic production processes is an effective method of research [2]. On the basis of the principles of the functioning of modern mass production it can be represented as a stochastic process, during which the manufacturing system changes from one state to another[3]. The production process state is determined by the state of the overall number N of items of work. However, if the number of objects of labor N is much greater than unity, then decide System of N equations second order is practically impossible. This clarification requires a transition from the object-process description to aggregated streaming description with the elements of probabilistic nature. The main difficulty in this specification is to highlight the characteristics of the parameters of states objects of labor, which could be measured in the study of the actual production processes. State of the j-th object of labor in the phase space will be described by state parameters[3]: $\vec{S}_j = (S_{j,1}, S_{j,2}, \dots, S_{j,A})$, $\vec{\mu}_j = (\mu_{j,1}, \mu_{j,2}, \dots, \mu_{j,A})$, where $S_{j,A}$ ($) value of the transferred α - of the technological resource or part thereof for the j-th subject of work, $\mu_{j,\alpha}$ - the intensity of the transfer value of α - of the resource to the j-th subject of work.

Integro-differential equation, is a kinetic equation that describes the processing of objects of labor during their movement on the technological route.

$$\frac{\partial \chi}{\partial t} + \frac{\partial \chi}{\partial S}\mu + \frac{\partial \chi}{\partial \mu} f = \lambda_p \{\varphi(t, S, \mu)[\chi]_1 - \mu\chi\}$$

In the case where the intensity μ is slowly varying with time, $\mu = \mu_0 \cong const$ (quasi-static process), the kinetic equation takes the form [1]:

$$\frac{\partial \chi}{\partial t} + \frac{\partial \chi}{\partial S}\mu = \lambda_p \left\{ \int_0^\infty [\varphi(t, S, \tilde{\mu}, \mu)\tilde{\mu}\chi(t, S, \tilde{\mu})] d\tilde{\mu} - \mu\chi \right\}, \qquad \frac{d\mu}{dt} = f(t, S) \cong 0,$$

which is used in the quasi-static description of the technological process. The kinetic equation of the form can be used to construct models of synchronized production lines.

Literature:

1. Пигнастый О.М. А Статистическая теория производственных систем / О.М.Пигнастый. – Харків: ХНУ, 2007. – 388 с.

2. Демуцкий В. П. Стохастическое описание экономико-производственных систем с массовым выпуском продукции / В. П. Демуцкий, В. С. Пигнастая, О.М.Пигнастый // Доповіді Національної академії наук України. – Київ: Видавничий дім "Академперіодика". – 2005. – N7. – С. 66 – 71.

3. Пигнастый О. М. О построении целевой функции производственной системы/ О.М.Пигнастый // Доповіді Національної академії наук України. – Київ: Видавничий дім "Академперіодика". – 2007. – №5. – С. 50 – 55.