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Pryvedenы method and Results of the study of influence of the shaft rotation frequency mixer for alkalinity diesel byotoplyva ego when cleaning. Installed optymalnaya frequency shaft mixer with diesel neytralyzatsyy byotoplyva at 40 °S.
Diesel byotoplyvo, alkalinity, mixer, frequency of rotation, neytralyzatsyya, metylovыy ether, Soap stock.

The methods and results of studies of the effect of frequency of rotation of the agitator shaft alkalinity of biodiesel in its cleaning. It was found the optimal frequency of the agitator shaft, while neutralizing the biodiesel fuel at 40°C.
Biodiesel, alkalinity, stirrer speed ,, neutralization, methyl ester, soapstock.

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TERMS OF SOLUTIONS OF WEAKLY PERTURBEDLINEAR BOUNDARY PROBLEMS (IF)$\mathrm{k} = -2$

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It is proposed and proved a theorem to obtain sufficient conditions for the existence of solutions of weakly perturbedlinear inhomogeneous boundary value problem in the case where the condition $P_{B_0} = 0$*,* $P_{B_0^*} P_{Q_d^*} = 0$ *is not fulfilled.*
Heterogeneity, boundary value problems, solutions.

Problem.The relevance of this topic is due, above all, the importance of the practical application of the theory of boundary value problems in the theory of nonlinear oscillations, the theory of stability of motion, control theory, a number of geophysical problems. On the other hand, the article received significant new findings complement research on the theory of nonlinear oscillations for slabozburenyh boundary problems.

The aim - to find sufficient conditions for the existence of solutions of linear nonhomogeneous impulsive boundary value problems with small perturbations when generating boundary value problem of impulsive has solutions for arbitrary right-hand side.

Materials and methods research. In the study of solutions of the problem used methods of perturbation theory developed in the writings A. Lyapunov and his followers, asymptotic methods of nonlinear mechanics, developed in the writings M. Krylov, M. Bogolyubov, Y. Mytropolsky, A. Samoilenko.

Results. We introduce the following notation: - dimensional matrix; $Q = lX(\cdot) - (m \times n)Q^* = Q^T$ --$(n \times m)$ dimensional matrix; $P_{Q^*} - (m \times n)$ - dimensional matrix (orthoprojector), that projects $\mathbb{R}^m$ on,; - D$N(Q^*)P_{Q^*}: \mathbb{R}^m \to N(Q^*)P_{Q_d^*} - (d \times m)$imensional matrix, which string is a complete system linearly independent rows of the matrix dP_{Q^*};Q^+ - uniqe psevdouniverse to $Q(n \times m)$-dimensional matrix; P_{B_0}- - To dimensional matrix (orthoprojector), that projects to null space - dimensional matrix $(r \times r)R^r N(B)(d \times r)B_0, P_{B_0}: R^r \to N(B_0); P_{B_0^*}$ - $(d \times d)$ - Dimensional matrix (orthoprojector), that projects to null space $R^d N(B_0^*)$ $(r \times d)$- Dimensional matrix $B_0^* = B_0^T,\ P_{B_0^*}: \mathbb{R}^d \to N(B_0^*)$.

If false, then to obtain sufficient conditions for the existence of solutions of the boundary value problem:$P_{B_0} = 0,\ P_{B_0^*} P_{Q_d^*} = 0$

$$\begin{cases} \dot{z} = A(t)z + \varepsilon A_1(t)z + f(t),\ t \neq \tau_i; \\ \Delta z_{|t=\tau_i} - S_i z = a_i + \varepsilon A_{1i} z(\tau_i - 0); \\ lz = \propto + \varepsilon l_1 z \end{cases} \quad (1)$$

with random inhomogeneities and we have a theorem which generalizes the corresponding result for boundary value problems with impulses from [1]$f(t) \in C([a,b]\backslash\{\tau_i\}_I),\ a_i \in \mathbb{R}^n \alpha \in R^m$

Theorem. Let and$rank\ Q = n_1 < n$

$$P_{Q_d^*}\left\{\propto - l\int_a^b K(\cdot,\tau)f(\tau)d\tau - l\sum_{i=1}^{p} \overline{K}(\cdot,\tau_i)a_i\right\} = 0, d = m - n_1,$$

false. In other words, suppose that the generating boundary value problem that results from (1) with:$\varepsilon = 0$

$$\begin{cases} \dot{z} = A(t)z + f(t),\ t \neq \tau_i; \\ \Delta z_{|t=\tau_i} - S_i z = \alpha_i; \\ lz = \propto \end{cases} \quad (2)$$

has not solutions for arbitrary inhomogeneities $f(t) \in C([a,b]\backslash\{\tau_i\}_I)$, $a_i \in \mathbb{R}^n$,$\alpha \in \mathbb{R}^m$. Then just following statements are equivalent:

a) for arbitrary $f(t) \in C([a,b]\backslash\{\tau_i\}_I),\ a_i \in \mathbb{R}^n$ and boundary value problem (1) has a unique solution as convergent with series$\alpha \in \mathbb{R}^m$ $z(t,\varepsilon)\varepsilon \in (0, \varepsilon_*]$

$$z\,(t,\varepsilon) = \sum_{i=-2}^{+\infty} \varepsilon^i z_i(t); \quad (3)$$

b) an arbitrary -dimensional constant vector -dimensional algebraic system$r\varphi_0 \in R^r r$

$$(B_0 + \varepsilon B_1 + \ldots)u_\varepsilon = \varphi_0 \quad (4)$$

has a unique solution in the form of convergent with series$\varepsilon \in (0, \varepsilon_*]$

$$u_\varepsilon = \sum_{i=-1}^{+\infty} \varepsilon^i u_i; \quad (5)$$

a) the conditions

$$P_{B_0} \neq 0, \;\; P_{B_0} P_{B_1} = 0, \;\; P_{B_0^*} P_{B_1^*} P_{Q_d^*} = 0. \quad (6)$$

Under this condition ensure uniqueness, and the condition - existence of solutions.$P_{B_0} \neq 0, P_{B_0} P_{B_1} = 0 P_{B_0^*} P_{B_1^*} P_{Q_d^*} = 0$

Proof. Substituting the series (3) in the boundary problem (1) and compare the coefficients of the same powers.ε

If then we have homogeneous boundary value problem:ε^{-2}

$$\begin{cases} \dot{z}_{-2} = A(t) z_{-2}, \; t \neq \tau_i; \\ \Delta z_{-2} \; {}_{|t=\tau_i} = S_i z_{-2}(\tau_i - 0); \\ l z_{-2} = 0, \end{cases} \quad (7)$$

which by assumption of the theorem has -parametric system solutions of the form where - random -dimensional column vector from.$r (r = n - n_1, n_1 = rank Q) z_{-2}(t) = X_r(t) c_{-1}, c_{-1} r R^r$

If, then boundary value problem:ε^{-1}

$$\begin{cases} \dot{z}_{-1} = A(t) z_{-}, + A_1(t) z_{-2}, \; t \neq \tau_i; \\ \Delta z_{-1} \; {}_{|t=\tau_i} = S_i z_{-1}(\tau_i - 0) + A_{1i} z_{-2}(\tau_i - 0); \\ l z_{-1} = l_1 z_{-2}. \end{cases} \quad (8)$$

For this boundary value problem with regard to

$$B_0 = P_{Q_d^*} \left\{ l_1 X_r(\cdot) - l \int_a^b K(\cdot, \tau) A_1(\tau) X_r(\tau) d\tau - l \sum_{i=1}^{p} \overline{K}(\cdot, \tau_i) A_{1i} X_r(r_i - 0) \right\}$$

obtain the algebraic relation system$c_{-1} \in R^r$

$$B_0 c_{-1} = 0.$$

This boundary value problem (8) has -parametric system of solutions of the type:r

$$z_{-1}(t) = X_r(t) c_0 + G_1(t) c_{-1},$$

where- random - dimensional column vector from; $c_0 \; r \; R^r$

$$G_1(t) c_{-1} = \bar{z}_{-1}(t) = \left(G \begin{bmatrix} A_1(\tau) z_{-2}(\tau, c_{-1}) \\ A_{1i} z_{-2}(\tau_i - 0) \end{bmatrix} \right)(t) + X(t) Q^+ l_1 z_{-2}(\cdot, c_{-1})$$

- particular solution of (8); expression $\left(G \begin{bmatrix} * \\ * \end{bmatrix} \right)(t)$ (7) has the form:

$$\left(G \begin{bmatrix} A_1(\tau) z_{-2}(\tau, c_{-1}) \\ A_{1i} z_{-2}(\tau_i - 0) \end{bmatrix} \right)(t) \stackrel{\text{def}}{=}$$

$$\left(\left[\int_a^b K(t,\tau)*d\tau - X(t)Q^{+}l\int_a^b K(\cdot,\tau)*d\tau, \sum_{i=1}^{p}\overline{K}(t,\tau_i)* \right.\right.$$

$$\left.\left. - X(t)Q^{+}l\sum_{i=1}^{p}\overline{K}(\cdot,\tau_i)*\right]\right)\times\begin{bmatrix}A_1(\tau)z_{-2}(\tau,c_{-1})\\ A_{1i}z_{-2}(\tau_i-0)\end{bmatrix}.$$

After equating the coefficients of the we obtain the boundary value problem to determine $\varepsilon^0 z_0(t)$:

$$\begin{cases}\dot{z_0} = A(t)z_0 + A_1(t)z_{-1}(t) + f(t), \ t \neq \tau_i;\\ \Delta z_{0\ |t=\tau_i} = S_i z_0(\tau_i-0) + A_{1i}z_{-1}(\tau_i-0) + a_i;\\ lz_0 = \alpha + l_1 z_{-1},\end{cases} \tag{9}$$

where$z_1(t) = X_r(t)c_0 + G_1(t)c_{-1}$.

From condition (necessary and sufficient) solvability:

$$P_{Q_d^*}\left\{\propto - l\int_a^b K(\cdot,\tau)f(\tau)d\tau - l\sum_{i=1}^{p}\overline{K}(\cdot,\tau_i)a_i\right\} = 0, d = m - n_1$$

for the boundary value problem (9) with respect are algebraic system:$c_0, c_1 \in R^r$

$$B_0c_0 + B_1c_{-1} = \varphi_0,$$

where - -dimensional continuous random vector from because of the arbitrariness $\varphi_0 r R^r f(t) \in C([a,b]\backslash\{\tau_i\}_I), a_i \in \mathbb{R}^n$ and $\alpha \in \mathbb{R}^m$;

$$\varphi_0 = -P_{Q_d^*}\left\{\propto - l\int_a^b K(\cdot,\tau)f(\tau)d\tau - l\sum_{i=1}^{p}\acute{K}(\cdot,\tau_i)a_i\right\},$$

$d\times r$-dimensional matrix has the form:B_1

$$B_1 = P_{Q_d^*}\left\{l_1G_1(\cdot) - l\int_a^b K(\cdot,\tau)A_1(\tau)G_1(\tau)d\tau - l\sum_{i=1}^{p}\overline{K}(\cdot,\tau_i)A_{1i}G_1(r_i-0)\right\}. \tag{10}$$

Boundary value problem (9) has -parametric system solutions:r

$$z_0(t) = X_r(t)c_1 + G_1(t)c_0 + G_2(t)c_{-1} + f_1(t),$$

where - arbitrary -dimensional column vector from;crR^r

$$G_2(t)c_{-1} = \left(G\begin{bmatrix}A_1(\tau)G_1(\tau)c_{-1}\\ A_{1i}G_1(\tau_i-0)c_{-1}\end{bmatrix}\right)(t) + X(t)Q^{+}l_1G_1(\cdot)c_{-1};$$

$$f_1(t) = \left(G\begin{bmatrix}f(\tau)\\ a_i\end{bmatrix}\right)(t) + X(t)Q^{+}\alpha.$$

Continuing this procedure, we note that to the series (3) has a solution of the boundary value problem (1) with random inhomogeneities $f(t) \in C([a,b]\backslash\{\tau_i\}_I)$, $a_i \in \mathbb{R}^n$ and$\alpha \in \mathbb{R}^m$ necessary and sufficient that it should be relatively soluble the following system of algebraic equations for arbitrary:$c_i \in R^r (i = -1,0,1,\ldots)\varphi_0 \in R^r$

$$\begin{cases}B_0c_{-1} = 0;\\ B_0c_0 + B_1c_{-1} = \varphi_0\end{cases} \tag{11}$$

and further:

$$\begin{cases} B_0c_1 + B_1c_0 + B_2c_{-1} = \varphi_1; \\ B_0c_2 + B_1c_1 + B_2c_0 + B_3c_{-1} = \varphi_2. \end{cases} \quad (12)$$

On the other hand, substituting the series (5) into (4) we find that to the series (5) was the solution of system (4) is necessary and sufficient that the coefficients satisfy a system similar to (11), (12) but with $u_i \in R^r \varphi_i = 0, i = 1,2, \ldots$:

$$\begin{cases} B_0u_{-1} = 0; \\ B_0u_0 + B_1u_{-1} = \varphi_0 \end{cases} \quad (13)$$

and further:

$$\begin{cases} B_0u_1 + B_1u_0 + B_2u_{-1} = 0; \\ B_0u_2 + B_1u_1 + B_2u_0 + B_3u_{-1} = 0. \end{cases} \quad (14)$$

To solve the system of algebraic equations (13) is necessary and sufficient to fulfill the condition (6). Then, to complete the proof of the theorem will confirm that in the case of solvability of equations (13), the system of equations (14) is also solved, and the last of the conditions of solvability of equation (13) we find the ratio. From condition of solvability (which coincides with the precondition) of the first equation (14) we find, ect. The proof of this theorem repeats the proof of the corresponding theorem in [1], so it will not repeat.$u_{-1}u_0$

Conclusions. If false, is to obtain sufficient conditions for the existence of solutions of boundary value problem (1) with random inhomogeneities $P_{B_0} = 0,\ P_{B_0^*}P_{Q_d^*} = 0\ f(t) \in C([a,b]\backslash\{\tau_i\}_I),\ a_i \in \mathbb{R}^n$, $\alpha \in \mathbb{R}^m$ should be involved - measurable matrix (10). Solution boundary value problem (1) is sought in this case in the form of convergent with series from.$(d \times r)B_1z(t,\varepsilon)\varepsilon \in (0,\varepsilon_*]k \geq 2$

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The paper proposed and proved the theorem to obtain sufficient conditions for the existence of weak solutions neliniazovanoyi inhomogeneous boundary value problem when condition is not satisfied.$P_{B_0} = 0,\ P_{B_0^*}P_{Q_d^*} == 0$

Heterogeneity, boundary value problems, solutions.

In this article proposals and proved a theorem Avto Receive dostatochnые terms for the existence of solutions of weakly

nelynyazovanoy neodnorodnoy boundary problem in sluchae, when not vыpolnyaetsya STATUS. $P_{B_0} = 0$, $P_{B_0^*} P_{Q_d^*} = 0$

Inhomogeneities, kraevaya task decision.

UDC 631.3.56

Quantitative indicators OTSINKYEKSPLUATATSIYNO FOR TECHNOLOGICAL reliability combine harvesters

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IL Rogovskiy, Ph.D.

In the article the methodological approach to the determination of quantitative indicators to assess the operational and technological reliability combine harvesters.

Combine, reliability, figure.

Problem. To assess the reliability of technical systems of renewable provides comprehensive and individual performance. Most of these indicators tends probable nature and will assess: reliability, maintainability, and durability zberihayemist technical system.

Analysis of recent research. Probabilistic performance adequately characterize the process of determining the reliability of agricultural machines or unit, having a clear short-term seasonal period of operation: Combine Harvester, Harvester, cultivating and sowing units [1, 2].

To assess the operational and technological reliability combine harvesters can be applied flow characteristics of random events (failures) that occur sequentially or in parallel with one another at certain times [3]. At the operational and technological reliability combine harvesters dominant influence have specific operating conditions and complex influence of many internal random factors of the combine, which is why the flow of events generally are not deterministic and stochastic flows [4].

This son to assess operational and technological reliability combine harvesters must justify the use of combined quantitative indicators are provided GOST 9361-95 as single and complex that characterize combine reliability and function of time of operation [5]. As stated in the thesis pre-operational technological reliability combine harvesters must